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EDITORIALS

INDEPENDENCE DAY CELEBRATIONS.

The old method of celebrating the Fourth of July through the medium of gunpowder in its various forms, owing to the large and growing number of fatalities which for many years accompanied it, has recently met with much opposition, and many communities have passed laws greatly restricting celebrations of that kind. Substitutes for the old methods are in demand and central-station men can do much in furthering the application of electricity in this connection. Electrical illuminations are a natural and popular substitute for the use of dangerous fireworks and, in addition to increasing the consumption of electric energy, they do much to advertise the more extended use of current. The Safe and Sane Fourth is making greater progress every year and it furnishes an opportunity which the local electrical manager or salesman may utilize with considerable benefit to both the community and the lighting company.

MUNICIPAL PLANT OBJECTS TO COMPETITION.

A rather novel incident has occurred in Terrell, Tex., where the city owns an electric light plant, and where there is also a privately owned electric light plant in operation. As is usually the case where there is competition in public-service enterprises, the two plants have had a spirited fight for several years, to the general detriment of service.

It is rather strange that a municipal plant, built supposedly to obtain the maximum benefit for the city, should object to any arrangement which might help the people, yet this is what the municipal plant in Terrell is apparently doing.

The privately operated plant in Terrell recently made arrangements with the Texas Power & Light Company for the building of a transmission line to Forney and Terrell, for the purpose of supplying electricity in wholesale quantity to said privately owned plant. The municipal plant in Terrell, fearing that the improved service which will be thus obtained by the private company will give the private plant an advantage, and fearing also that the private plant may establish a reduced rate for service, has started court proceedings to prevent the transmission line from being built.

This is another instance which shows the folly of a municipally owned plant when it is possible to obtain reliable service at less cost from a privately owned company.

LEAK LOADING OF TELEPHONE LINES.

The history of applied physics furnishes many examples to show that usually a development which admits of commercial application will receive a fuller and wider theoretical investigation than others. In the field of wire telephony the series loading of the line with inductors greatly enlarged the possibilities of long-distance telephony. In consequence this subject has been very fully investigated. What the fate of the loading coil would have been had a satisfactory telephone repeater been first made available it is not easy to say, but certainly developments would have followed a somewhat different path.

The leak loading of telephone lines has not proved to be of commercial importance and consequently has been comparatively neglected. At least little has been published upon this subject, although it is quite possible that the engineers of commercial or operating companies have fully investigated its possibilities from the theoretical standpoint. Lines of this character have been proposed for telephony and cable telegraphy, but their characteristics have not proved favorable. Upon other pages of this issue will be found an article by Prof. Arthur E. Kennelly, of Harvard University and the Massachusetts Institute of Technology, who has worked out the relations involved in leak loading and has developed two new formulas for expressing these relations. By taking advantage of the mathematical similarity of the expression for admittance as affected by leaks and the expression for impedence as affected by series inductance, he has reduced the two problems to calculations of the same kind. Numerical examples are given to show the application of the very simple formulas which have been derived.

Professor Kennelly is an ardent advocate of the use of hyperbolic functions in electrical computations and gives here a very good example of the great advantage and simplicity obtained by their application. In such a problem as this, unless hyperbolic functions are applied, the situation becomes very complicated and the amount of work necessary in carrying out numerical examples is tremendous.

Leak loading may in certain cases be advantageous and by reducing the attenuation may improve telephonic transmission, but the improvement only occurs within a certain narrow range of frequency. This inherent limitation of the method of loading by leaks or shunt resistances is pointed out by Professor Kennelly. A series-loaded line transmits a broad range of frequencies and thus has great advantages in practical application over the method of loading by leaks.

THE GRADUATION SEASON.

The present month has seen several hundred graduates of courses in electrical engineering set out to make their way in the world. It is well understood by others, but not always so well understood by these young men themselves, that they are not yet engineers, but that they may be expected to have a better foundation upon which to build up the qualifications of an engineer than others who have not had the same educational advantages. What the technical graduate should have acquired during his college course is the knowledge of the fundamentals of engineering science, that is to say, the underlying principles of physics, chemistry, etc. This is the basis upon which, through a familiarity with engineering details such as may be acquired in actual experience with practical work, the real structure of a competent engineer may be built. The training given in good engineering schools is thorough and intensive and the graduate should have acquired habits of work and thought which will stand him in good stead in later life.

It is of the utmost importance that the man who aspires to become an engineer should not only know the basic principles underlying his profession, but that he should have the power to apply the knowledge which is in his possession. This is a qualification which is often unfortunately lacking in the college graduate. The best way to learn is by doing, and no information or knowledge which cannot be applied by the possessor is of much value in helping him to the accomplishments which go to make up success in life.

The engineer primarily is one who deals with the materials and forces of nature, and he understands how to handle *things*. In carrying out this work it is natural that he should specialize, but care must be taken that specialization is not too narrow. In accomplishing large things it is not sufficient merely to know how to handle the necessary materials, but it is essential to know also how to handle *men*, for this is one of the important things in all lines of accomplishment in organized society. To occupy a position of importance, the engineer must be able to speak and write effectively and convincingly. Here again is a point in which college graduates are often lamentably weak, and at the same time they often wonder why they are expected to study English in an engineering course. The ability to effectively use the English language both by tongue and by pen is an important qualification for the engineer as well as in nearly every other profession.

The college graduate in the raw state is of little value to the industry and is sometimes discouraged on this account. He should remember, however, that through application, and acquisition of experience, through contact with practical work, he is in a position to develop into a real engineer, and that the beginner starting out with the knowledge of principles which he should have acquired in college is in a far better position for reaching the ultimate goal of success than is the man who has not had such a preparation.

INTERCONNECTING POWER SYSTEMS IN ENGLAND.

In connection with the advice given by the Board of Trade to British electric supply authorities urging them to interconnect their respective systems wherever this can be done with convenience and with a view to national economy and efficiency, much interest is being taken in a scheme which is already in a forward state in one of the busiest centers of English industry. Under the auspices of the Municipal Electrical Association of Lancashire and Cheshire, a committee is at work preparing a scheme for connecting up the principal supply stations in the two counties. These comprise municipal and company light and power stations, also railway and tramway power stations. The area of the two counties has been divided up into six districts, for each of which a separate subcommittee is now at work collecting technical data, etc.

In the London district a number of interconnection schemes have already, during the war, been carried into effect, municipal and company undertakings in several places having working agreements covering such matters as mutual assistance for emergency demand, standby plant provision, and so forth, all of which is already making both for efficiency and economy. The movement is expected to have most important results in various parts of the United Kingdom, and it may lead on to the setting up of that Electricity Board which has lately been so much discussed by the Institution of Electrical Engineers. The ultimate outcome in London must be anticipated as one in which power generation will be centralized in a few large stations.

It may well be that the development may have one very desirable result which is not among the expressed intentions of either the Government Department which is advocating it, or the engineers who are studying it for the sole immediate purpose of coal economy and conservation. We refer to the possibilities of co-operative policies of a general character respecting the working and management of such undertakings being evolved and adopted. Through the medium of an Electric Supply Publicity Committee an attempt was made, spreading over several years, to co-operatively deal with publicity and advertising, and there was also an Electrical Development Committee whose function was to jointly encourage all sorts of commercial electrical applications. The former committee never accomplished all that was expected of it, and it is now no longer in existence. The latter committee has had its activities interfered with by the war, but it will find its hands very considerably strengthened by the present interconnection spirit when it is able to resume its activities.

CULTIVATING FOREIGN BUSINESS RELATIONS.

In connection with the article published in the last issue covering the desirability of making present preparation for future trade in foreign countries and especially in Russia, it has come to our attention that many manufacturers are very delinquent in establishing a favorable reputation among foreign firms. In one particular case numerous inquiries have been received from foreign firms asking for quotations on prospective orders, but owing to the fact that the output of the factory for months to come has already been contracted for, the manufacturer is paying no attention to these inquiries and not even showing the courtesy of a reply stating his inability to quote prices.

This manufacturer is not only spoiling his own chances for business when the domestic trade becomes slack, but is also injuring the general reputation of American firms and making it harder for those desiring export business to create a good impression upon prospective customers. The American manufacturer is prone to devote his entire attention to the present and to make insufficient preparations for the future. Export trade may be given the cold shoulder when orders are too numerous for acceptance, but ill-mannered treatment of inquiries will not prove an easy path to the cultivation of such business at a time in the future when it may be greatly desired.

In connection with the matter of extending foreign credits and obtaining information upon which to base them, it would be well for electrical manufacturers to extend the practice which has been developed by the electrical credit associations of this country to the foreign field. An exchange of information between parties interested, or at least letting it be known when foreign firms are encountered who will abuse credit accomodations, would make it far easier for American electrical manufacturers to handle foreign business. It may be of advantage to know in this connection that for many years the Philadelphia Commercial Museum has been acting as a clearing house for information of this character and may prove of great benefit in this connection to electrical manufacturers and exporters. This is a situation where co-operation is very feasible and very effective.

THE EVIL OF THOUGHTLESSNESS.

On another page of this issue is published a communication from Mr. E. A. Bechstein, manager of the Sandusky Gas & Electric Company, Sandusky, O., relating to the harm that may be done through thoughtlessness upon the part of central-station managers in suggesting to traveling salesmen selling points based upon alleged dangers incident to electrical circuits.

Under certain conditions dangers may arise due to the proximity of electrical circuits and the utilization of electrical energy. Dangers may also arise from a great many other causes, but the dangers having an electrical origin are sometimes peculiar and the man selling an appliance devised to minimize accidents of an electrical nature is quick to grasp any suggestion which indicates even a remote possibility of the danger and spreads the suggestion broadcast in seeking to establish pertinent reasons for the installation of the equipment he is selling.

Mr. Bechstein's suggestion that central-station managers in particular be guarded in their statements is to the point. We do not counsel any evasion of definite issues, or the shirking of any responsibility, but we do endorse a policy of caution in establishing unnecessary suggestions. Alarming headlines and illustrations of sputtering wires, smoking irons and houses ablaze may be used to promote the sale of accident-prevention apparatus, but when these suggestions have the endorsement of electrical men they cannot be considered as constructive, nor as favoring the development of public confidence in electrical service.

INCONSISTENCY.

A committee of the City Commission, Jersey City, N. J., is endeavoring to interest neighboring municipalities in Hudson, Essex, Union, Passaic and Bergen Counties in bringing concerted action before the State Board of Public Utility Commissioners for a reduction in the rates for electric light and power service, as well as gas, now charged by the Public Service Corporation. This reduction is sought upon a basis of community population instead of the general territorial rate plan in force, it being held that the cost of generating and distributing electrical energy to the thickly populated sections is less per individual consumer than in the more sparsely settled districts.

This is self-evident and should, with utmost consistency, be operative and applicable to all phases of public-utility operations, if to any at all. Yet Jersey City, in connection with the railroad tax question recently at issue, apportioned high taxes on local railroad terminals with a claim that such terminals were made valuable only by the combined traffic of all the counties in the state, and in fact all states in the Union. Thus Jersey City is profiting through the railroad rates levied on all traffic on the railroad systems.

While this contention is in direct contradiction to the argument set forth for a readjustment of local lighting charges, if it holds true it would certainly seem to apply in the question of uniform lighting rates for all sections, and Jersey City, as one, should be willing to co-operate with neighboring and smaller municipalities, showing a spirit of reciprocity in allowing these communities the benefits and advantages of a low and uniform electric rate—the same as local inhabitants enjoy. A more generalized point of view is desirable in promoting a more general and less congested development of the territory.

Happenings in the Industry

Michigan Section, N. E. L. A., Holds Annual Convention-Cruise and Discusses Important Utility Topics—America's Electrical Week Local Committeemen Appointed—Illinois Electrical Contractors Hold Annual Meeting at Rockford—Niagara Falls to Be Permanently Flood Lighted—Miscellaneous News Notes

UTILITY PROBLEMS DISCUSSED BY MICHIGAN SECTION.

Relations with Public Important Topic of Convention-Cruise —Section Considers Consolidation with Wisconsin Electrical Association.

The first sessions of the convention of the Michigan Section, National Electric Light Association, were marked by papers and discussion of public utilities, both private and municipal, and their relations with the communities served. In a paper on "The Utility and the Consumer," H. H. Crowell, of Grand Rapids, defined community and governmental functions, outlined the purpose of franchises and gave points of control and regulation of utilities. He spoke of municipal ownership of electric plants as a delusion and thought the best way to crowd out the public's tendency in this direction was for central stations to give good service and to do their best each day.

A paper entitled "Street Lighting Service by Municipally Owned Plants," prepared by A. C. Marshall and read by Secretary Silvester, presented some statistics on finances and service of municipal plants to show unprofitableness of them. Both papers were the subject of much discussion.

As customary in preceding years, the annual convention was in the form of a four-day lake cruise. The start was made from Grand Haven on the steamer *Arizona* early on the afternoon of Sunday, June 18, with a registration of 115, including members, friends and families. The whole was one big family bent on friendly enjoyment of the outing. A short stop was made at Mackinac Island, Monday morning. The next stop was Parry Sound. Here the party was transferred to the steamer *Waubic* for the trip through the Thirty Thousand Islands to Penetanguishene. Re-embarking on the *Arizona*, the run was made to Sault Ste. Marie, leaving there Wednesday for the return trip to Grand Haven.

The first session was called to order Monday morning by President S. A. Freshney, of Grand Rapids, who in the opening address briefly outlined the Section's activities during the year. He stated the membership was now over 40 Class A and 60 Class B. Various members discussed the need of greater co-operation with the National Association, bringing out the advantages of members referring problems to that body. Mr. Freshney spoke of the proposed affiliation with the Wisconsin Electrical Association to form a Great Lakes Section, and recommended the fusion. Appointment of committees on "safety first" problems was urged, as well as one on "electric ranges," the latter to secure member co-operation in promoting that field. He also recommended a committee on industrial heating.

Mr. Crowell's paper on "Utility and the Community" was the first to be presented. After stating the rights of utilities and communities, he said all interests should receive consideration. Depressing legislation is detrimental because of its effect on the investment market. It is necessary to convince public that conditions in financing utilities are satisfactory. Capital invested demands fair treatment. He was particularly insistent that municipal ownership was an unsuccessful creation which can be guarded against by giving public best service possible. "The corporation has a soul and must never furnish impersonal service," he said.

H. A. Fee, of Adrian, and J. A. Cavanaugh, of Benton Harbor, emphasized the personal element in service to the public.

R. W. Hemphill, Detroit, said that frankness is necessary in public relations and aloofness detrimental to a utility.

The second session was opened by a paper on "Troubles," by J. A. Cavanaugh. Central-station manager's troubles were cited in typical cases, laying emphasis on his dealings with customers. The struggles to satisfy customers were recounted. The manager's position is absorbing and interesting because of the diversity of demands on him.

J. W. Bishop, of Detroit, told of short-circuit in manhole that cost $25,000. R. E. Keller, Kalamazoo, laid emphasis on the necessity of maintaining efficient complaint department. George Lewis, Ann Arbor, cited cases of a loose armature on shaft that caused trouble.

W. J. Johnson, of Jackson, then read a paper on "Merchandising," by D. H. Thomas, Lansing. After outlining present-day practice, he said that merchandising should be based on service, incentive to salesman, intensive cultivation, market survey, appliance maintenance, capital and proper accounting. R. W. Hemphill called attention to distinction of central stations selling service instead of energy. H. H. Crowell said service constitutes a satisfactory return to customers for money expended. Mr. Johnson outlined sales methods in wiring campaign instituted by his company. J. E. Stanton, of Belding, and H. A. Fee also discussed various phases of merchandising.

A. C. Marshall's paper on "Street Lighting by Municipally Owned Plants" was of a statistical nature, tending to disprove successful operation of such plants. He gave an analysis of business of eight typical plants pointing to that conclusion. For privately owned plants it was advocated that low rates for street lighting with low margin of profit was good business. H. A. Fee agreed with latter statement, saying street lighting was a good by-product of commercial business. J. A. Cavanaugh added that a low rate decreases the likelihood of municipal competition. Remarks on this subject were made by Messrs. Keller, Hemphill, Crowell and Johnson.

Tree Trimming, Handling Credits, Voltage Standardization and Electric Heating were other subjects discussed. A brief report of these will be given in the next issue.

America's Electrical Week Local Committeemen Appointed.

Every city with a population of 20,000 or over will have a committee in charge of local arrangements for the America's Electrical Week campaign this Fall.

The National Executive Committee in charge of the big movement, of which Gerard Swope, vice-president of the Western Electric Company, is chairman, recently announced its appointments of chairmen and local committeemen. Over 1,200 representative electrical men have been appointed. The Executive Committee, through the Society for Electrical Development made every effort to have the list representative of the different electrical interests, the Jovian Order, the Rotary Clubs and Civic Associations where they rendered co-operation during the Electrical Prosperity Week campaign.

The committee realized that the success of the campaign to a great extent depends upon local committees, so the committees were named with the idea that the men selected would and could devote some time to making the national affair successful in their respective cities. A central-station representative was placed on the committee in every city. This was done because central-station support is necessary.

Where representatives of other interests were not named by the National Committee, the chairman of the local committee was requested to complete the committee. The list is not considered final as new names and new cities will be added as the campaign progresses.

The committee list is most imposing. It contains the names of many nationally prominent men who have accepted the chairmanship of local committees, and who have pledged support to the big week. Following are some of the chairmen:

J. B. McCall, president, Philadelphia Electric Company.

John F. Gilchrist, vice-president, Commonwealth Edison Company, Chicago.

W. H. Atkins, general superintendent, Edison Electric Illuminating Company, of Boston.

John A. Britton, vice-president, Pacific Gas & Electric Company.

W. J. Barker, vice-president, Denver Gas & Electric Light Company.

Thomas A. Wynne, Reigning Jupiter, Jovian Order.

R. R. Young, commercial manager, Public Service Electric Company, Newark.

Frank R. Coates, president, Toledo Railways & Light Company.

W. E. Robertson, president, Robertson-Cataract Electric Company, Buffalo.

Franklin T. Griffith, president, Portland (Ore.) Railway, Light & Power Company.

A. W. Leonard, president, Puget Sound Traction, Light & Power Company.

The Jovians are expected to be especially active this year in supporting the campaign. Plans have already been formulated to bring about closer relations between the Society for Electrical Development and The Jovian Order. With this end in view, James M. Wakeman, general manager of the Society, Harry W. Alexander, director of publicity, and George W. Hill, of the field co-operative staff, have been appointed by Thomas A. Wynne, Reigning Jupiter, as statesmen-at-large. The America's Electrical Week local committees and Jovians will everywhere work together with the Society to make the campaign the success it is destined to be.

Throughout the late summer and fall, members of the Society's staff will visit different sections of the country to address the Jovian leagues, chambers of commerce, and to assist the committees in their celebration and sales plans.

Illinois Electrical Contractors Hold Annual Meeting.

The fourteenth annual meeting of the Electrical Contractors' Association of the State of Illinois was held at Rockford, Ill., on June 16 and 17. Headquarters of the association were at the Nelson Hotel, but the meetings were held in Reco Hall. The convention was attended by quite a number of contractors who brought their families with them, it partaking of the nature of an outing whose enjoyment was somewhat spoiled by unfavorable weather, however.

On Friday afternoon the first session, which was an open meeting, was called by President J. N. Pierce. An address of welcome was made by Judson S. Joslyn, president of the Chamber of Commerce of Rockford, who commented upon the emphasis now being given to accurate accounting in all lines of business. He cited statements made by the Federal Trade Commission on the great necessity for American business men to have accurate knowledge of the costs of conducting business. A number of short addresses were also made by representatives of jobbing, manufacturing and other interests. The association then held a closed meeting. On Saturday morning another closed session concluded the actual business of the convention.

Among the matters that came up at these business sessions was the question of concentric wiring. This was freely discussed and the matter referred to a committee with S. N. Tideman, chairman. This committee will look into the subject further and co-operate with other organizations that are considering this matter; the report on this subject is to be presented at the next semi-annual meeting to be held in Chicago next January. The subject of co-operation between central-station companies and electrical contractors was also discussed; eight reports were received from different cities regarding the nature of co-operation in existence. This matter also was referred for further action at the next semi-annual meeting when it is hoped that more complete reports on the subject will be available. Reports were received from various officers and other purely association business matters were taken up. Election of officers of the association for the ensuing year resulted as follows:

President, J. N. Pierce, Chicago. Vice-president, J. T. Marron, Rock Island. Secretary-treasurer, L. B. Van Nuys, Peoria. Directors, L. C. Crawley, Peoria; E. F. Pendergast, Rockford; M. N. Blumenthal, Chicago. State delegates to the National Association of Electrical Contractors, R. W. Poelma, Chicago; William McGuineas, Chicago; and E. F. Pendergast, Rockford.

Entertainment features of the convention consisted of a boat trip on the Rock River on Friday evening, an automobile ride about Rockford on Saturday afternoon, and the association banquet on Saturday evening. For the ladies attending, there were special automobile and launch rides on Friday afternoon and Saturday morning.

Niagara Falls to Be Flood-Lighted.

The City Council of Niagara Falls, N. Y., has authorized an expenditure of $10,000 for the illumination of Niagara Falls. The money is to be devoted to carry out the flood-lighting scheme submitted by the American Lighting Company, Chicago. For some weeks Will J. Davis, president of the company and inventor of the flood-lighting system of the American Lighting Company, has been making arrangements to illuminate the falls, and for several nights previous to the action of the City Council a battery of 25 flood lights was turned on the American Falls and the rapids of the Niagara River.

The effect created was so far beyond the expectations of the promoters of the project that the expenditure was enthusiastically approved, and it is now planned to double the number of lamps in service and from time to time to add to the battery as new lighting effects are desired.

Paul A. Schoellkopf, commissioner of the Niagara State Reservation, is particularly enthusiastic over the demonstration, and it is due to his efforts in great measure that the City Council has taken such definite action with regard to the illuminating scheme. Mr. Schoellkopf has expressed the belief that the illumination of the falls will insure the stopping over in Niagara Falls, N. Y., of many transients who would otherwise remain only for a few hours during the day. It is proposed to light only the American falls, making it a purely American proposition. Mr. Schoellkopf has tendered the services of the employees of the Hydraulic Power Company free of charge to the city, and it is understood that the Niagara Falls Power Company is to donate the power necessary to operate the lights.

With the flood-lighting system employed there is no dark center or wings in the light-beam, and the falls are smoothly and softly lighted. The beam is powerful enough to penetrate the densest parts of the rolling mist, and owing to the intensity of the flood lighting the entire illuminating scheme is carried out on a very economical expenditure for energy.

The representatives of local newspapers, after viewing the partial illumination, were enthusiastic in their endorsement and have all applauded the action of the City Council in voting the appropriation.

Miscellaneous NEWS NOTES

Electrical Engineering Class at Illinois.—Out of the total of 222 degrees granted students in the College of Engineering at the University of Illinois, 43 were the degrees of electrical engineering. This number was only exceeded in the department of mechanical engineering, there being 44 degrees granted in this branch.

Electric Cooking School in Portland.—A free cooking school was recently opened by the Northwestern Electric Company, of Portland, in the Pittock Block in that city. The school is in charge of Mrs. L. M. Hayes, who has an enviable reputation in the Northwest. It is understood the school will be a permanent institution.

Interesting Lectures Before Trenton Electric Club.—W. A. Moore, switchboard specialist of the General Electric Company, tendered an interesting address on switchboard work before the Trenton (N. J.) Electric Club, June 5. William L. Doyle, Trenton, head of the insulated wire department of the Roebling Company, addressed the club on June 19.

Seattle Municipal Plant Active.—Superintendent of Lighting J. D. Ross reports that during the month of May the municipal lighting department of Seattle, Wash., signed 500 new contracts for city light. To date, according to Superintendent Ross, the total number of contracts held by the lighting department is 43,000. The municipal lighting department recently installed a display room in the new city-county building where exhibits of electrical cooking apparatus are on display.

Inventory of Colorado Utility to Be Made.—A complete inventory of the Colorado Springs (Colo.) Light, Heat & Power Company is to be made by order of the State Public Utilities Commission. When the commission revised the electric rate schedules, which became effective last March, the company was notified that the new schedule would be in force until March 1, 1917, at which time the company would be expected to present its books and complete inventory of its property to the commission.

Employees of One Company Save $350,000 in Four Years.—In a report presented on June 16, before the annual convention of the New York State League of Savings and Loan Associations at Elmira, N. Y., it was shown that the employees of one company alone had in four years saved $350,000. This record in saving was made by the New York Edison Savings and Loan Association, an employees' organization of the New York Edison Company. It was started in 1912 with 550 members and only $17,000 in deposits. There are now 2,611 members all of whom receive from 5 to 6.5 per cent dividends, semi-annually on their investment according to class of shares. The organization is unique in that the Company bears the entire cost of operation and stands behind the Association.

British Electricity Board Suggested.—It is generally recognized in Great Britain that during the war no practical steps can be taken to secure definite co-ordination of electricity supply systems and service in that country. Though London's schemes are in a state of suspense, that has not prevented the Institution of Electrical Engineers devoting an evening to profitable discussion of a question of which London's problem is but a small, though important, part. E. T. Williams introduced the matter on April 13, by proposing that steps be taken for setting up a large Electricity Board for the control of the electricity supply of the whole of Great Britain, and for co-ordination of the various electrical interests, assisting existing undertakings, whether municipal or company owned, and taking upon itself only those functions of generation and distribution which are essential to the furtherance of wise development and a supply at the lowest cost. Reference was made to the success obtained by the Ontario Hydro-Electric Commission in co-ordinating the electricity supply systems in the Province of Ontario, Canada.

Annual Meeting of New York Electrical Society.—At the annual meeting of the New York Electrical Society held at the Hotel McAlpin on June 14, the following officers were elected for the ensuing year: Putnam A. Bates, president; C. E. Scribner, Edwin B. Katte, and W. C. Whiston, vice-presidents; George H. Guy, secretary, and Thomas F. Honahan, treasurer.

Preparedness at Los Angeles.—At the meeting of the Los Angeles Jovian Electric League, Wednesday, June 14, the subject under discussion was "Preparedness" and addresses were given by George S. Patton and General Harrison Gray Otis.

Possible Municipal Competition Contested.—The Central Indiana Lighting Company, operating at Columbus, Ind., and vicinity, has brought action against the City of Columbus and the Sanborn Electric Company, of Indianapolis, for a permanent injunction to restrain the municipality from purchasing electric equipment from the Sanborn company. The lighting company holds that the city has intentions of engaging in commercial lighting work in competition with its local system, and upon which territory a 20-year franchise is held. The complaint also sets forth that the recent contract made by the city with the Sanborn company for electric equipment for a new plant at a cost of $15,000 is illegal under the terms of its franchise, and moreover, that the city does not require such extensive equipment to replace any feature of the present lighting system.

Illuminating Engineering Lecture Course.—Referring to the course of lectures to be given at the University of Pennsylvania in September under the auspices of the Illuminating Engineering Society, G. H. Stickney, a former vice-president of the Society, recently said: "The 1916 lectures will be of great value to those interested in the design of lighting installations, whether as purchasers, salesmen, engineers, constructors, physiologists or artists. Beyond the value rendered to those fortunate individuals who attend the course, there is a broader value which is bound to be realized, the same as in the 1910 course. The course will have a marked influence in advancing the art of illumination. Through its influence a better standard of lighting will be secured throughout the country. Inartistic and glaring light will be strenuously condemned and misconceptions rectified. The precious power of sight will be more carefully conserved. What a boon it would be to the public if the architects and others throughout the country, responsible for lighting, were to receive the instruction here to be offered!"

Decision in Portland, Ore., Valuation Case.—The Railroad Commission of Oregon has set the reproduction cost new of the property of the Portland Railway, Light & Power Company at a total of $45,337,000. Deducting depreciation, the value on the property was placed at slightly less than $41,000,000. Formal hearings on the valuation began on January 25, 1915. Last October the company filed its final brief in the case. In that document the company contended that a just and fair valuation lay somewhere between $61,795,629 and $62,134,542. The former figure was given as the value of the property as determined by its original cost plus subsequent increments. The latter figure was given as the value of the property as determined by the reproduction analysis, considering the going value of the concern. From the company's original claim of $61,000,000 which included going value, water rights, etc., the commission eliminated about $6,250,000 of property, contending that it was non-operating. Also the commission eliminated the company's claim for going value on the contention that the company did not compute such value correctly. An opportunity, however, will be given to the company to present additional testimony on this.

Electricity in Boiler and Radiator Manufacture

Plant Rehabilitation Involves the Installation of Electric Drive to Facilitate Labor-Saving Methods and Proper Sequence of Operations, Increasing the Production and Reducing Costs

Industrial Power Series—Article No. 168.

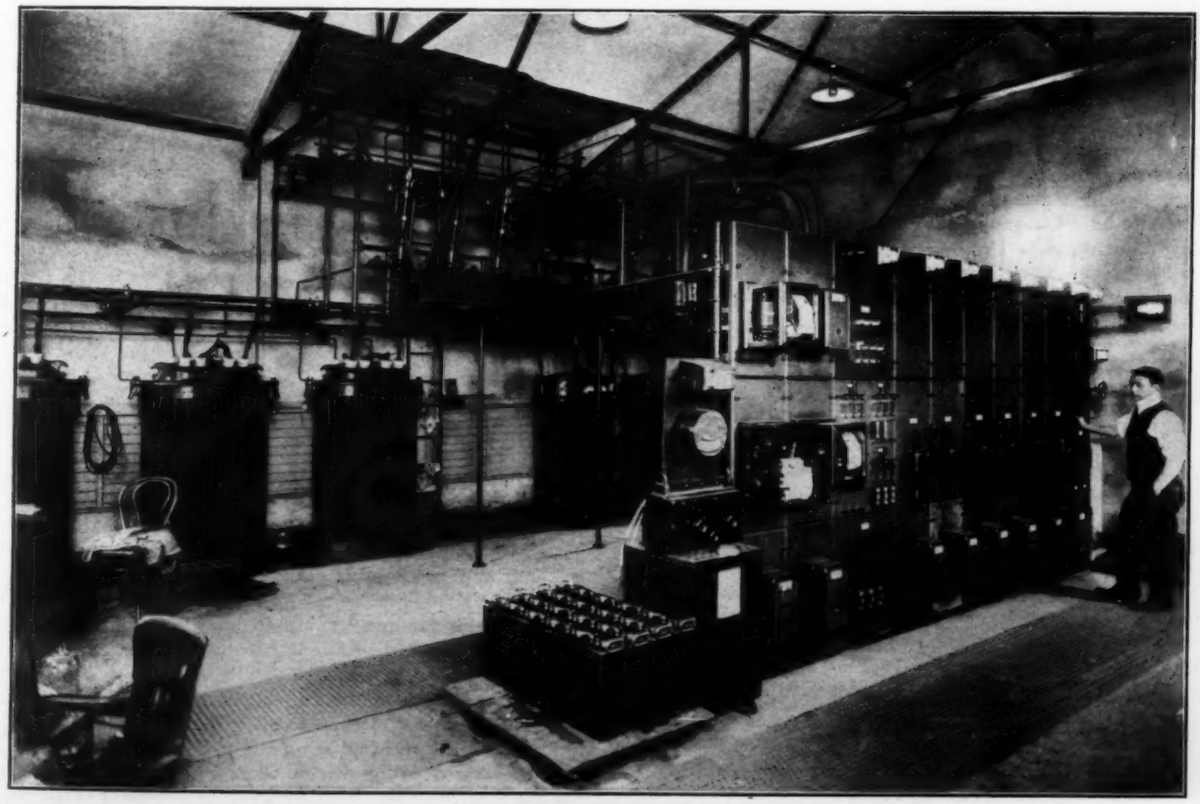
THERE are many established companies throughout the country who adhere to old equipment and methods until reorganization, but when a more progressive element is introduced manifest changes in manufacture take place. This is true of the Pierce, Butler & Pierce Manufacturing Company, Eastwood, N. Y. This company manufactures boilers and radiators for heating purposes and, in line with a new policy, not only have departments been rearranged to facilitate production, but general improvements in the buildings and surroundings have been made. Line shafting has been largely eliminated and electric drive is used entirely.

The location of the equipment has been arranged so as to facilitate logical sequence of operations, and labor-saving devices introduced which decrease operating expenses and increase production. The rehabilitation of the plant has been accomplished under the supervision of E. S. Deane, plant manager, who is an ardent advocate of electric-motor drive and has had extensive experience in the electricfication of manufacturing plants.

Much of the work carried on in this plant depends upon foundry processes, and every effort has been made to increase production and quality with modern devices. As the cast parts are of comparatively small size, it is essential that they be handled expediently and moved in a general direction to obviate rehandling raw and finished material as much as possible. In the machine departments, as well as elsewhere, individual drive predominates, and where there is group drive the shafts are short. The machine equipment has been installed with a view of performing the operations with high speed and with as little handling of the material as possible; consequently, many of the machines perform much of the work in duplicate. That is, a boring machine, for example, will bore out and face several holes in boiler headers or radiator columns at one time.

By the use of individual drive, the operating expense of each machine ceases as soon as it is stopped, and, furthermore, individual machines or departments can be crowded to pick up certain lines of work that may be dragging behind other departments. The ease of control of individual machines increases their production and improves the quality of the work. It may be interesting to note here that with the present cost of energy at 1.5 cents a kilowatt-hour that the bills are less than they were under an old contract when the energy cost 0.875 cent a kilowatt-hour. This is due to improved production methods and increased use of electric drive, together with largely eliminating power transmission by mechanical methods, with its attendant friction loss.

At the present time the company is operating 66 induction motors, exclusive of the direct-current crane motors, the former aggregating over 900 horsepower. The induction motors are the squirrel-cage type, equipped with standard pulleys where belt drive is used. The direct-current crane motors are supplied by a motor-generator set, consisting of an induction motor driving a 250-volt, direct-current generator. The majority of the motors are General Electric make, with some Allis-Chalmers and Westinghouse motors.



Interior of Service Substation, Pierce, Butler & Pierce Manufacturing Company.

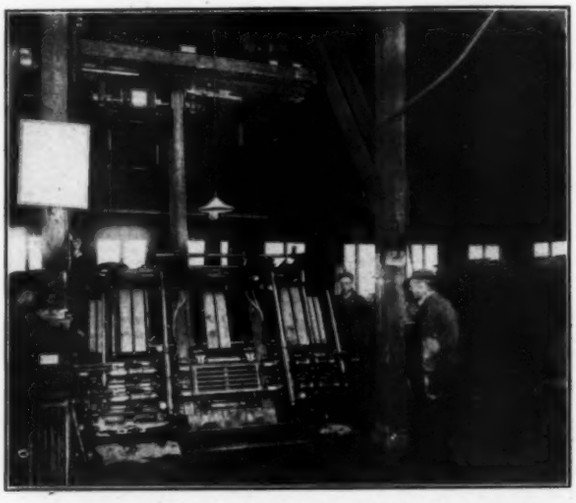
Air Compressor Driven by 200-Horsepower Induction Motor.

Service is supplied by the Syracuse Lighting Company from its 11,000-volt, three-phase, 60-cycle power distribution system. The line comes overhead and is supported outside of the transformer substation by a pole containing the lightning arresters and choke coils. The transformer building is of tile, brick and concrete construction and is located centrally in the group of buildings composing the plant. There are two banks of oil-insulated, self-cooled transformers, each unit having a capacity of 100 kilovolt-amperes. The voltage is reduced from 11,000 to 220, the latter being the operating voltage throughout the plant. The high-tension bus-bar structure and circuit-breakers are located above the transformers. There is a large switchboard containing feeder panels and totalizing panels. One totalizing panel is maintained by the central station and one by the company and are provided with both integrating and graphic wattmeters. By suitable switch connections various departments can be connected with the local graphic meter and the power consumption checked. At the left-hand side of the switchboard there is a Westinghouse mercury rectifier for charging the batteries of an electric truck used for the transportion of material about the shops. All power feeders are run in underground ducts and all wiring throughout the building is being rapidly changed from open to conduit construction.

In the foundry there are a large number of pneumatic hoists for handling molds and castings. These are being displaced by electric cranes as fast as possible. Air for the pneumatic hoists is supplied by an Ingersoll-Rand Imperial 12 by 16-inch and 13 by 16-inch air compressor, belt-driven by a 200-horsepower induction motor operating at 600 revolutions per minute. For emergency use, there is an Ingersoll-Rand Imperial 14 by 12-inch and 8 by 12-inch air compressor, belt-driven by a 50-horsepower induction motor with a speed of 850 revolutions per minute. The most of the water used about the plant, including that used for testing purposes, is drawn from a pond fed by springs. There are two pumps, one for day use of the triplex type, geared to a 20-horsepower induction motor operating at 850 revolutions per minute, and a second pump for night use of the same type, geared to a 5-horsepower motor. During the day a 100-pound water pressure is maintained, and at night the pressure is reduced to 40 pounds. The motor-generator set for supplying the cranes consists of a 35-horsepower induction motor driving a 22.5-kilowatt direct-current generator with an electromotive force of 250 volts and operating at 1,700 revolutions per minute. All pig iron is handled with a lifting magnet, energy for which is provided by a 220-volt generator driven by a steam engine on a 15-ton Brown locomotive crane.

Motor-Driven Grinding Machine. Electric Truck in Foreground.

Taking up the different departments of the factory in their logical order, the pattern shop for wood patterns has a machine equipment consisting of two wood lathes group-driven by a 3-horsepower, 900-revolutions-per-minute motor; a surface and a pony planer group-driven by a 10-horsepower, 900-revolutions-per-minute motor, a band saw bolted to a 2-horsepower motor, and a circular saw belted to a 3-horsepower motor. For metal patterns there is a



Motor-Driven Boring Machine for Radiator Columns.

2-horsepower motor driving an engine lathe, and a group of machines, consisting of an engine lathe, four drill presses, planer, shaper and grindstone, driven by a 10-horsepower motor with a speed of 900 revolutions per minute.

Air for the foundry cupolas is furnished by three Root blowers, chain-driven by a 75-horsepower, 720-revolutions-per-minute motor, a 55-horsepower, 514-revolutions-per-minute motor, and a 40-horsepower, 675-revolutions-per-minute motor, respectively. The second motor is being replaced by a 75-horsepower, 720-revolutions-per-minute motor. The foundry is divided into different departments for different products. All core sand is sifted by a sand sifter driven by a 10-horsepower, 900-revolutions-per-minute motor. For supplying small molds, there is a sifter consisting of a gyratory riddle traveling on a trolley and operated by a 0.25-horsepower motor. This sifter will handle all the sand that can be shoveled into it by two men and can be moved to accommodate the work. There is a portable sand sifter mounted on a truck for serving larger molds, which is driven by a 10-horsepower motor. For the facing sand in the radiator foundry there is an equipment of a sand sifter and a bucket elevator group-driven by a 20-horsepower motor. The sand, after being sifted, is raised to overhead bins ready to be drawn off when needed.

Motor Data Sheet—Boiler and Radiator Manufacturing.

Pierce, Butler & Pierce Manufacturing Company, Eastwood, N. Y.
Service from Syracuse Lighting Company—11,000/220-volt, three-phase, 60-cycle system.
Squirrel-cage induction motors with standard pulleys for belt drive.

No.	Horse-power.	Speed, R. P. M.	Kind of Drive.	Application.
1	200	600	Belt	Ingersoll-Rand air compressor. Supplies compressed air to air hoists, sand blasts, etc.
1	35	1,700	Direct-connected	Direct-current generator, 22.5 kilowatts, 250 volts. Supplies direct current to electric traveling cranes.
1	20	850	Gears	Triplex water pump.
1	5	900	Gears	Triplex water pump.
1	50	850	Belt	Ingersoll-Rand air compressor. Emergency use.
1	20	900	Group	Six tumblers.
1	55	514	Chain	Root foundry blower.
1	20	900	Belt	Tumbler.
1	40	675	Chain	Root foundry blower.
1	5	.....	.....	Jarring machine for tamping sand in molds.
1	10	.....	.....	Portable sand sifter.
1	3	900	Group	Two wood lathes.
1	10	1,610	Group	Surface planer and buzz planer.
1	2	900	Belt	Band saw.
1	3	900	Belt	Three circular saws.
1	2	900	Individual	Engine lathe.
1	10	900	Group	Engine lathe, four drill presses, planer, shaper, grindstone.
1	75	720	Chain	Root blower, foundry type.
1	10	900	Belt	Tumbler.
1	20	900	Group	Bucket elevator, sand sifter.
1	0.25	.....	Individual	Sand sifter.
1	10	900	Individual	Core sand mixer.
1	20	900	Belt	Machine for cleaning radiator castings.
1	3	900	Group	Three emery grinders.
5	5	900	Individual	Five boring machines for radiators.
2	10	900	Individual	Two radiator presses.
1	3	900	Group	Five small drill presses.
1	10	900	Belt	Boring and tapping machine.
1	3	900	Belt	Cross-cut saw.
1	3	900	Group	Drill press and grindstone.
1	3	900	Group	Two circular saws for box making.
1	20	900	Group	Boring mill, two pipe machines, drill press, grinder, punch.
1	5	900	Group	Three hand lathes, drill press, three emery grinders.
1	5	900	Group	Three drill presses.
1	5	900	Group	Four emery grinders, drill press.
1	10	900	Group	Three engine lathes, drill press.
1	20	900	Individual	Face grinder.
1	3	900	Individual	Radial drill.
1	1	900	Individual	Bolt machine.
2	5	900	Individual	Two boring mills, multiple type, for boiler side and top headers.
1	3	900	Individual	Drill press.
1	5	900	Individual	Multiple threading machine for nipples.
1	10	900	Individual	Boring machine.
1	10	900	Individual	Multiple machine for finishing nipples.
1	10	900	Individual	Multiple boring and tapping machine.
1	0.5	.....	Individual	Emery grinder.
1	3	900	Individual	Multiple miller.
1	10	900	Individual	Planer.
1	3	900	Individual	Radial drill.
1	7.5	900	Individual	Radial boring and threading machine.
1	5	900	Individual	Radial boring and threading machine.
1	1	900	Individual	Ring grinder.
2	10	900	Individual	Two machines for boring and tapping headers.
1	20	900	Individual	Grinding machine.
1	3	900	Individual	Radial drill.
1	10	900	Individual	Milling machine.
1	7.5	900	Individual	Automatic elevator.
1	10	900	Group	Miscellaneous small machines.
1	10	900	Group	Miscellaneous small machine tools.

Monthly kilowatt-hour consumption for one year—May, 1915, to April, 1916, inclusive.

Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
May	31,360	September	39,860	January	50,460
June	32,910	October	42,600	February	53,800
July	35,830	November	45,340	March	57,420
August	37,770	December	37,600	April	60,440

Very little hand ramming of the sand in the molds is done. Pneumatic and electrically-operated jarring machines are substituted, which consist of a platform on which the flask rests and which is vibrated by a suitable mechanism. The electrically operated machine is driven by a 5-horsepower motor. For cleaning the small castings there are several

Motor-Driven Boring Machine.

motor-driven groups of tumblers. The radiator columns are cleaned by a machine which passes the columns under revolving wire brushes. This machine is driven by a 20-horsepower, 900-revolutions-per-minute motor.

Radiator columns and boiler heaters are cast with a core and the former are joined by nipples with a pressed fit. There is an equipment of five radiator boring machines, which bore and face the column openings, each individually driven by a 5-horsepower, 900-revolutions-per-minute motor. The radiators are assembled on a pressing machine and the several columns through pressure are joined by the nipples. There are two pressing machines, each driven by a 10-horsepower, 900-revolutions-per-minute motor. There are, of course, numerous other boring and tapping machines included in the equipment. There are extra, assembling, millwright and tool departments, all equipped with electric drive. One machine in particular demands especial attention. It is a grinding machine for finishing the surfaces of the work and displaced 13 machines and over 200 men. It is individually driven by a 20-horsepower, 900-revolutions-per-minute induction motor.

Piano Moving by Electric Trucks.

There is perhaps no trade to which the electric vehicle is better adapted than to piano delivery, a business in which skill as a piano mover must be combined with that of a chauffeur. Steinway & Sons, who are one of the largest users of electric vehicles in this service, have displaced all of their horse-drawn vehicles with electrics, and are now operating a fleet of five, varying from 3,000-pound to 5,000-pound capacity. When in 1910, Steinway & Sons, after thorough investigation decided that motor equipment would materially reduce operating expenses as well as increase the effectiveness of their delivery system, they were but living up to a tradition which was formed when Henry F. Steinway laid the foundation of Steinway & Sons in 1853, by insisting that in business methods as well as in pianofortes the name of Steinway should always stand second to none.

Almost every Steinway piano which has left the factory within the past six years, has made part of its journey in a power wagon, for a regular shuttle service is operated between the Long Island City factory and the Fourteenth Street branch in Manhattan. The pianos are built and assembled in Long Island City and are then shipped to Fourteenth Street where the cabinet work and crating are done. The two machines in this service make three, sometimes four round trips a day, each trip approximating six miles. These two transfer cars are housed in a garage adjoining the factory and are attended in every particular by their drivers.

The three other electrics which are used for actual delivery purposes in the city are in active service for nearly 12 hours a day, their runs varying from 40 to 60 miles. At the shipping office in the New York building, a charging plug has been provided which is used to "boost" the batteries while the machines are being loaded. This "boosting" not only makes possible the long mileage accomplishments but serves to keep the batteries at very nearly full charge most of the time.

The electrics average approximately 15 deliveries per day with an average cost of 20 cents per mile which includes every possible expense in their upkeep and operation.

Development of Electric Irrigation in Colorado.

During the past two years the Arkansas Valley Railway, Light & Power Company has been encouraging the use of electricity for pumping irrigation water in the large territory served by its lines in central and southern Colorado. More interest is being taken in the subject this year than ever before and many large electric pumping plants are being installed. Not only are electric installations used for irrigating private ranches using water secured from wells, but in several instances electric pumps are used for pumping water seepage from irrigation ditches back into the ditches—thus conserving water which would otherwise go to waste. Owners of the irrigation ditches also use electric pumps for furnishing a steady flow of water when the headgates of the Arkansas River are closed. A new irrigation company has been recently organized in Pueblo, which will utilize water from wells pumped electrically. Among the advantages of an underground water supply for irrigation it is claimed that the use of the cold water increases the acre production over that secured from the use of warm ditch water. More than 1,500 acres have been put under irrigation so far this year by private ranchers operating from the electric lines of the Arkansas Valley company, and the demand for service of this nature is growing steadily.

New Power Contracts in Louisville.

Several isolated lighting plants are to be displaced in Louisville and other motive power supplanted by central-station service under contracts which have just been closed by the representatives of the Louisville Gas & Electric Company. The Todd Building, the first of the steel-construction office buildings in Louisville, with two elevators, hydraulic, has contracted for two 500-volt, direct-current, Otis electric cars and will supplant the isolated lighting plant with central-station service. Heat will also be supplied from the central station. The requirements of this building, with others which were supplied from it, call for a connected load of 100 kilowatts. The Columbia Building, with four hydraulic elevators, the first ten-story building in the city, built before the days of steel construction, will supplant its steam pump with a centrifugal pump to be electrically operated on central-station power, while the lighting load also will be taken over.

The electric company has obtained the contract for serving the new factory of the Louisville Oak Flooring Company. The waste problem at this plant will not be serious since it will operate on dimension stock with a minimum of wastage, all of which will be used to supply heat for the dry kiln. The load at this plant will be 200 horsepower.

Formulas for Lines With Uniform Leak Loads

By A. E. Kennelly

New formulas are given for leak-loaded lines, and a comparison in parallel columns is presented of the respective formulas for series-loaded and leak-loaded lines, indicating their similarity.

Uniform smooth conducting lines may be regularly loaded at uniform intervals, either with impedance, or with leaks. A loaded line of the former type is commonly described as a series-loaded line (Fig. 1) and of the latter type, as a leak-loaded line (Fig. 2). Series-loaded lines are well known in wire telephony. Leak-loaded lines, which were suggested by Prof. S. P. Thompson, of London, in 1893, are but little known, although their properties may yet be utilized. It is proposed to present in this article two seemingly new formulas for dealing with leak-loaded lines, and then to draw a comparison between corresponding formulas for the two types of loaded line, since a remarkable parallelism runs between them, which assists the student to apprehend and to remember both.

We may consider the case of continuous-current steady-state lines of uniform linear conductor resistance and dielectric

Fig. 1.—Series-Loaded Line.

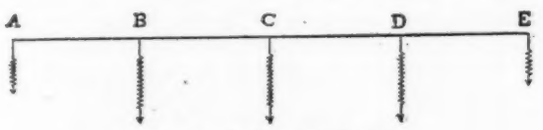


Fig. 2.—Leak-Loaded Line.

leakance. The results so obtained are then immediately applicable to alternating-current steady-state lines subject to a single frequency, by interpreting the formulas vectorially; or in complex quantities. We may, therefore, add an angle sign $\angle$ to the units of the formulas, to indicate their capability of being used with complex quantities.

Let a uniform single conductor A B C D, be operated by steady continuous currents, supplied, say, from storage batteries, to ground or zero-potential return. Let this line have uniform linear conductor resistance of z ohms per wire kilometer, and a uniform linear leakance of y mhos per wire kilometer. Then its propagation constant, or linear hyperbolic angle, is known to be:

$$\alpha=\sqrt{zy} \quad \text{hyperbolic radians per kilometer or hyps./km.} \angle \ldots\ldots (1)$$

and its characteristic or surge impedance:

$$z_0=\sqrt{z/y} \quad \ldots\ldots\text{ohms} \angle \ (2)$$

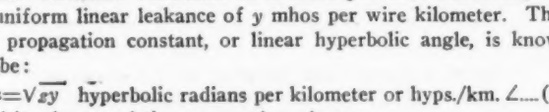


Fig. 3.—Uniform Smooth Line in Sections of Equal Length.

If now the line is arranged in sections AB, BC, CD, etc., of equal length L kilometers; then the angle subtended by each section (Fig. 3) is

$$\theta=L\alpha=\sqrt{ZY} \quad \ldots\ldots\text{hyps} \angle \ (3)$$

where Z is the total conductor resistance, per section, in ohms, and Y the total dielectric leakance, per section, in mhos.

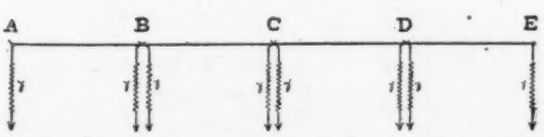


Fig. 4.—Leak-Loaded Line with Semileak at the End of Each Section.

If a leak of $\Gamma=2\gamma$ mhos is applied at each section junction A, B, C as in Fig. 2, then each loaded section may be regarded as a line of θ hyps, and surge resistance z_0, loaded at each end with a leak of γ mhos, as in Fig. 4.

The behavior of the line before and after loading may be imitated, at section junctions, by an artificial line in the laboratory, consisting of Π sections. The equivalent Π of an unloaded section[1] (Fig. 5), may be produced, by known methods, with a certain architrave resistance ρ'' ohms, and a leak in each pillar of g'' mhos. A line of such Π-sections will simulate exactly the behavior of the actual unloaded line at section junctions A, B, C. . . . . When therefore we apply a leak of 2γ mhos to the actual line at each junction, we require to add γ mhos to the g'' mhos in each pillar of the equivalent Π, in order to produce the equivalent Π of the loaded line. In other words, the equivalent Π of a loaded line section differs only from that of the unloaded line section by having a conductance of $g''+\gamma$ mhos, instead of g'' mhos, in each pillar.

The angle θ_1, subtended by a loaded line section, between section junctions, is known[2] to be derivable also from the formula:

$$\tanh\frac{\theta_1}{2}=\sqrt{\tanh\frac{\theta}{2}\tanh\left(\frac{\theta}{2}+\delta\right)} \quad \ldots\ldots\text{numeric} \angle \ (4)$$

where δ is an auxiliary hyperbolic angle, defined by:

$$\tanh\delta=\gamma z_0=\gamma/y_0 \quad \ldots\ldots\text{numeric} \angle \ (5)$$

y_0 being the characteristic admittance of the unloaded line, or the reciprocal of its characteristic impedance z_0.

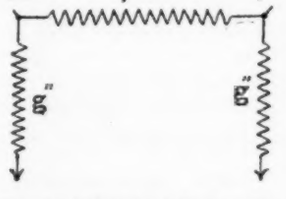


Fig. 5.—Equivalent Π of a Single Section Prior to Application of Leak Loads.

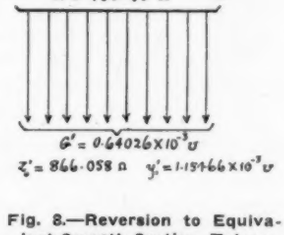


Fig. 8.—Reversion to Equivalent Smooth Section, Taken Between Midleaks.

But it may be shown that another formula for deducing the loaded-section angle is

$$\cosh\theta_1=\cosh\theta+(\gamma/y_0)\sinh\theta \quad \ldots\ldots\text{numeric} \angle \ (6)$$

which bears an evident analogy to Campbell's formula[3] for the corresponding loaded-section angle of a series loaded line, see (13).

Moreover, it is known[2] that the characteristic impedance of the loaded section can be found from the formula:

$$z_0'=\frac{z_0}{\sqrt{\left(1+\frac{\gamma}{y_0}\tanh\frac{\theta}{2}\right)\left(1+\frac{\gamma}{y_0}\coth\frac{\theta}{2}\right)}} \quad \ldots\ldots\text{ohms} \angle \ (7)$$

But it may also be readily shown that this is equivalent to:

$$y_0'/y_0=\sinh\theta_1/\sinh\theta \quad \ldots\ldots\text{numeric} \angle \ (8)$$

which is a much shorter and simpler formula.

1 "Artificial Lines for Continuous Currents in the Steady State" by A. E. Kennelly, *Proceedings American Academy of Arts and Science*, Vol. 94, p. 97, November, 1908.

2 "The Application of Hyperbolic Functions to Electrical Engineering Problems" by A. E. Kennelly, London University Press, 1912, p. 46.

3 "On Loaded Lines in Telephonic Transmissions" by G. A. Campbell, *Philosophical Magazine*, VI. Vol. 5, p. 313, March, 1903.

As an example of the use of the formulas in the direct-current case, we may consider a uniform single line with a linear resistance of $r=10$ ohms per kilometer, and a leakage of $y=2.5\times10^{-6}$ mho per kilometer, with a leak of $\Gamma=0.5\times10^{-3}$ mho, applied at uniform intervals of 50 kilometers. Required the section angle and surge impedance of the line before and after the loading.

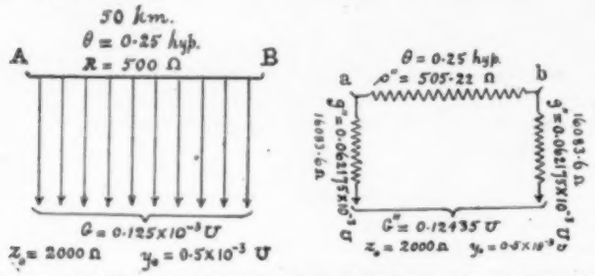


Fig. 6.—Section of Unloaded Line and Equivalent Π of Unloaded Section.

Fig. 6 shows the diagram of a 50-kilometer section of the smooth line before the application of the leak loads, and also the equivalent Π which is its external counterpart. The architrave ab has a line resistance 505.22 ohms as against 500 ohms in the line section AB, and each pillar has a leak of 0.062175 millimho, giving a total leakage of 0.12435 millimho, as against 0.125 millimho in the smooth line AB. The angle subtended by either the smooth line AB, or the Π ab, is $\theta=0.25$ hyp. and the surge impedance of each is $z_0=2{,}000$ ohms, corresponding to a surge admittance $y_0=0.5$ millimho.

If now a half millimho of leakance is applied at each section junction, we obtain the conditions shown in Fig. 7, where the total leak applied at each junction is divided into halves, and one such half-leak is added to each end of the section AB.

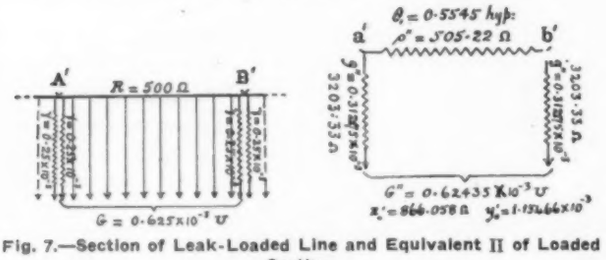


Fig. 7.—Section of Leak-Loaded Line and Equivalent Π of Loaded Section.

Fig. 7 gives the equivalent Π, $a'b'$, of the section after the addition of these terminal half-leaks; and also the equivalent smooth line $A'B'$ corresponding thereto. It will be seen that the architrave resistance $a'b'$ remains the same as at ab in Fig. 6, but the pillar leaks are each increased by 0.25 millimho. The equivalent smooth line is indicated at $A'B'$, Fig. 8 with an angle θ of 0.5545 hyp., a surge impedance z_0' of 866.058 ohms, and a surge admittance of 1.15466 millimho. The total conductor resistance in such a section would be 480.23 ohms with an associated leakance of 0.64026 millimho.

Using formulas (4) and (5),

$\delta=\tanh^{-1}(0.25\times10^{-3}/0.5\times10^{-3})=\tanh^{-1}0.5=0.549307$ hyp.

also $\tanh(\theta_1/2)=\sqrt{\tanh 0.125\,.\tanh 0.674307}=\sqrt{0.12435\times0.58780}=0.270357$; whence $\theta_1/2=0.27725$ and $\theta_1=0.5545$ hyp., the leak-loaded section angle.

Again using (8), $y_0'/0.5\times10^{-3}=\sinh 0.5545/\sinh 0.2500=0.58336/0.25261=2.30931$, and $y_0'=0.5\times10^{-3}\times2.30931=1.15466\times10^{-3}$ mho, corresponding to $z_0'=866.058$ ohms. Here the effect of loading the line with leaks at section junctions has been to increase the section angle from 0.25 to 0.5545 hyp. and to diminish the surge resistance from 2,000 to 866.058 ohms.

As an alternating-current case, we may consider a smooth line with uniform sections 2.607 kilometers (1.62 miles) in length, having the following constants:

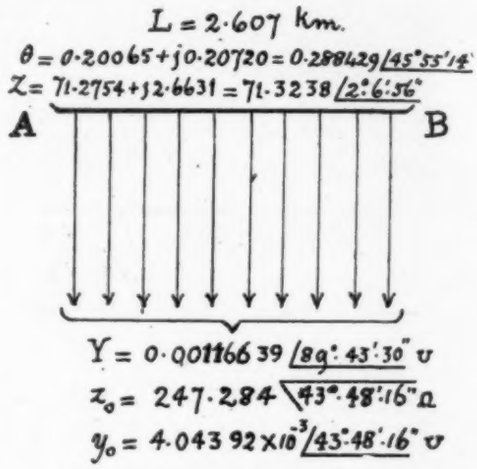


Fig. 9.—Unloaded Smooth Section.

$r=27.34$ ohms per wire kilometer (44 ohms per wire mile)

$l=0.202\times10^{-3}$ henry per wire kilometer (0.325×10^{-3} henry per wire mile)

$g=2.15\times10^{-6}$ mho per wire kilometer (3.46×10^{-6} mho per wire mile)

$c=0.08948\times10^{-6}$ farad per wire kilometer (0.144×10^{-6} farad per wire mile) and with an impressed frequency, at the sending end, of 796 cycles ($\omega=5{,}000$).

A single smooth and unloaded section of this line is indicated in Fig. 9. Let a leak of 7.5 ohms and 0.15 millihenry, i. e., of impedance $7.5+j750=750.04\angle89°\,25'\,37''$ ohms, or, of admittance $\Gamma=(0.0^{3}3332-j1.3332)10^{-3}=1.33327\times10^{-3}\angle-(89°\,25'\,37'')$ mho, be applied at each section junction throughout the line. This means adding a half-leak

$\gamma=(0.006666-j0.6666)10^{-3}=0.666635\times10^{-3}\angle-(89°\,25'\,37'')$

mho to each pillar of the equivalent Π $A''B''$, Fig. 10, bringing the loaded Π into the condition A_2B_2 shown in Fig. 11. The

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Series-Loaded Line.

Load at junction, $\Sigma=2\sigma$ ohms $\angle$.
Angle subtended by loaded section, θ.
Surge impedance unloaded, z_0.

Surge admittance unloaded, $y_0=1/z_0$.
Auxiliary angle of load, $\delta=\tanh^{-1}(\sigma/z_0)$.
Angle subtended by loaded section, θ_1.

$$\tanh\frac{\theta_1}{2}=\sqrt{\tanh\frac{\theta}{2}\tanh\left(\frac{\theta}{2}+\delta\right)}$$

$\cosh\theta_1=\cosh\theta+(\sigma/z_0)\sinh\theta.$
$=\cosh\theta+\tanh\delta\sinh\theta.$

Surge impedance of loaded line measured at any junction,
$z_0'=1/y_0'.$
$z_0'/z_0=\sinh\theta_1/\sinh\theta.$

Leak-Loaded Line.

$\Gamma=2\gamma$ ..... mhos $\angle$ (9)
θ hyps $\angle$
z_0 ohms $\angle$

$y_0=1/z_0$ ..... mhos $\angle$ (10)
$\delta=\tanh^{-1}(\gamma/y_0)$ ..... hyps $\angle$ (11)
θ_1 hyps $\angle$

$$\tanh\frac{\theta_1}{2}=\sqrt{\tanh\frac{\theta}{2}\tanh\left(\frac{\theta}{2}+\delta\right)}\quad\text{.....(12)}$$

$\cosh\theta_1=\cosh\theta+(\gamma/y_0)\sinh\theta$ ..... (13)
$=\cosh\theta+\tanh\delta\sinh\theta.$

$z_0'=1/y_0'$ ..... ohms $\angle$ (15)
$y_0'/y_0=\sinh\theta_1/\sinh\theta$ ..... numeric $\angle$ (16)

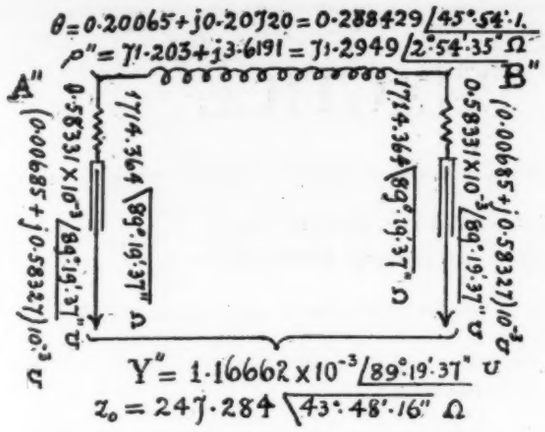


Fig. 10.—Equivalent II of Unloaded Smooth Section.

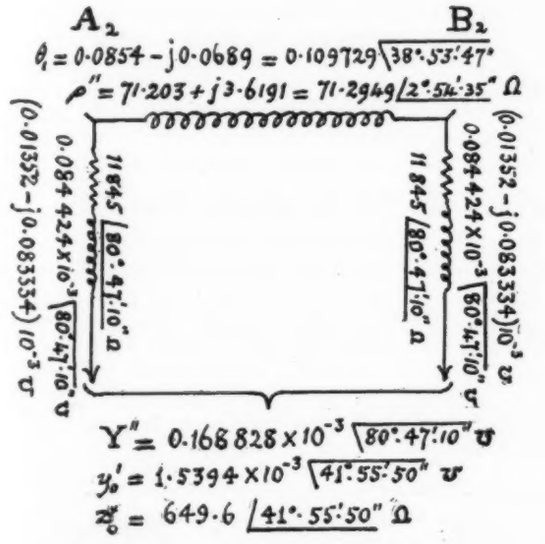


Fig. 11.—Equivalent II of Loaded Section.

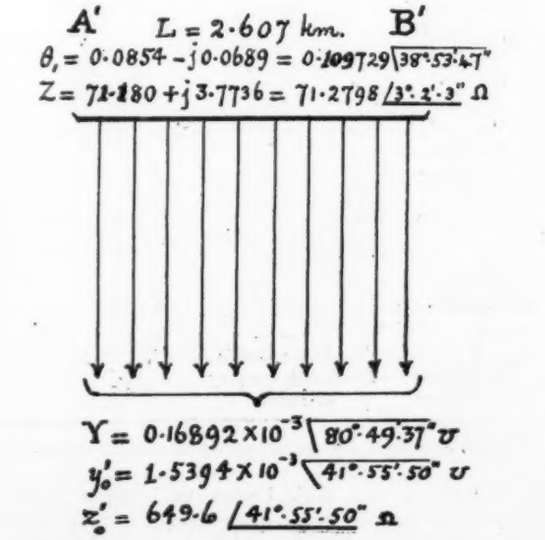


Fig. 12.—Reversion to Equivalent Smooth Section Taken Between Midleaks.

smooth line to which II A_2B_2 of Fig. 11 reverts, is shown in Fig. 12. It will be observed that, at this particular frequency, the effect of the uniform leak loading is to reduce the section angle from 0.20065+j0.20720 hyp to 0.0854—j0.0689 hyp; while changing the surge impedance from 247.284 ∠—(43° 48′ 16″) to 649.6∠41° 55′ 50″. The attenuation on the loaded line is less than that on the original unloaded line; but this improvement only occurs within a certain range of frequency. In other words, this line will transmit alternating currents, of the particular frequency 796, much farther, when loaded with these leaks, than when unloaded; but the improvement due to loading extends only over a relatively small range of frequency.

The results shown in Fig. 12 are also obtainable from either formulas (4) and (8), or (6) and (8).

Collecting the series-loaded and leak-loaded line formulas we have the table on the preceding page.

Formulas (12) and (16) are the most suitable for use in alternating cases, when tables and charts of complex hyperbolic functions are available. It will be seen that the formulas for determining θ_1, (12) and (13), are similar; whereas, those for determining z_0' and y_0' (16) are also similar, but mutually inverted.

The arithmetical procedure for determining the characteristic constants θ_1 and z_0' of a regularly loaded line is therefore the same, whether series or leak loads are used. First, the loaded section angle θ_1' is found by (12) or (13), and then either z_0' or y_0' is found by (16).

Scientific Men and Industrial Development.

Another of the series of meetings arranged in connection with the movement for better organization of British electrical and engineering industries has been held, at which Professor Marchant, of the Liverpool University, urged once more the all-importance of science and scientific methods in order to maintain efficiency in industry. Especially is it the case that the scientific use of material and scientific design will lead to successful development in electrical engineering. The quality of the product must be maintained, and to that end highly trained technical men are essential, and in order that the right type of men should be available, there must be close and continual intercourse between manufacturing firms and engineering schools. The relations between the two should be most intimate and cordial.

Professor Marchant referred to the immense value to the engineering schools and colleges of knowing from the men who employed their students how they acquitted themselves. It was of equal value to the manufacturer to know what kind of men he could obtain and where he could get them. He described the satisfactory working of this arrangement in connection with the Liverpool University Engineering School for some time past, leading representatives of big manufacturing firms having acted in co-operation with them. The School could have placed twice as many well-trained men as it had available. The usefulness of such relations in connection with industrial research was also referred to, special mention being made of the scheme which has been in operation for several years in connection with the University of Pittsburgh. Professor Marchant advocated strongly a grant for such purposes of $250,000 per annum, to be made to the Institution of Electrical Engineers and to other engineering institutions, to enable research work to be carried out in suitable laboratories in different parts of England. He believed that it was in this matter of industrial research work that England had fallen behind, but it would be lamentable if pure scientists were to forsake their pure science to attack industrial problems, as both kinds of research are necessary.

If progress is to be made, highly trained technical men are the first necessity—not only to occupy technical positions, but to act as directors and leaders of industry, to know when and how to take advantage of new discoveries.

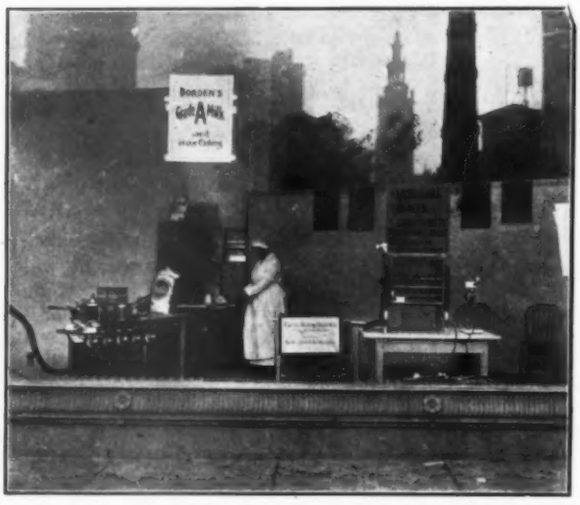
COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Suffragists Boost Electric Cooking in New York.

While electric-range selling campaigns have been going on in various parts of the country, New York City has had an interesting and impromptu demonstration of electric cooking. It came about through the opening of the new State suffragist headquarters in the Albermarle Building, Broadway and Twenty-fourth Street.

The suffragists decided to give a free piece of chocolate



Electric Cooking Demonstration by Suffragists in New York Show Window.

cake to every one buying a ticket for the baseball game between the Giants and Cincinnati at the Polo grounds on suffrage day, June 3. They also wanted to have a cooking demonstration going on in the window to tempt passers-by and lure them inside to taste the delicacies. So they called on the New York Edison Company for suggestions and aid. C. N. Lewis, manager of the Heating Bureau, provided them with the latest type of electric range and with a glass oven in which it is possible to watch the cake baking.

Large crowds were always on the sidewalk watching the cakes baking in the glass oven. The other electric equipment of the kitchen consisted of a chafing dish, double-boiler, tea-kettle and egg-beater.

Company Offers Electric-Fan Service Free to Invalids.

The Nevada (Mo.) Utilities Company is performing a charitable service in Nevada that not only wins it many compliments, but calls attention to the great utility of the electric fan. A few days ago it advertised in the local newspaper as follows:

"During the hot weather this company will render electric fan service free to invalids unable to pay for it, upon receipt of proper advice from the attending physican. This offer, of course, is available to buildings adjacent to our present located lines."

There was no immediate demand for the service, and no large demand is anticipated. But the manner of presenting the value of the electric fan has undoubtedly won favor for the company.

Low-Price House-Wiring Campaign in Lowell.

The Lowell (Mass.) Electric Light Corporation is conducting a house-wiring campaign on the specially low price of $24.92, covering a one-light, drop-fixture in the front hall, a two-light chandelier in living and dining rooms, and a one-light straight pendant in the kitchen. The price includes lamps and shades. The small initial payment of $4.92 and $2 a month for ten months, covers the installation. Four contractors share in the contracts, at established unit prices.

Electric Gifts for the Newly Wed Advertised by Boston Company.

The Boston Edison Company, ever on the alert to improve an opportunity to extend the uses of electric current, is featuring the attractiveness of electrical household devices as timely and useful gifts for brides of the season.

These appliances as well as table lamps, which are also suggested as welcome, are today made in such attractive patterns that their merit of usefulness is scarcely more

Electrical Gifts Are Always Timely Especially for Brides
Such Gifts go so Well with the New Home
Every one has Definite and Valuable Uses. The Giver can make no mistakes. We sell you only the Gifts that can be used on the Electric Service of the place where the Happy Bride is to live.
Remember that Electricity is in common Use for Light almost Everywhere — Electric Home Comforts as Gifts mark your Up-to-Date Taste.
Purchases by Edison Customers can be Made on Our Easy-Payment Plan—without extra charge.
Call at 39 Boylston Street or any one of our 15 Suburban Stores and see our Wonderful Displays. Ask for Our Booklets on Edison Service in the Home.
The Edison Electric Illuminating Company of Boston
Electric Toasters $3.75—up
Electric Grills $5—up
Electric Chafing Dishes $10—up
Electric Reading Lamps $5—up
Electric Flat Irons Special June Sale at $3.50
Electric Coffee Percolators $7—up
Electric Curling Irons $3.50—up
Electric Water Heaters Coolers or Boiler $5.50—up

Timely Appliance Advertisement of Boston Company.

to be considered than their beauty as house ornaments. Coffee percolators and chafing dishes are sure to be acceptable gifts for the "newly weds" of whatever rank and station. The accompanying illustration shows a typical advertisement of the series.

The Personal Element in Advertising

By Charles H. Seaver

To obtain the maximum results from central-station advertising it is essential that every employee of the company familiarize himself with the copy and work in harmony with the advertising department, particularly should there be close co-operation between sales and advertising departments. Various suggestions for co-operation are given in this article, which is the fourth of a series dealing with central-station advertising and publicity. Another article will be published in an early issue.

The "All Together, All the Time, For Everything Electrical" of the Jovian Order is as valuable a motto for the central-station advertising man as it is for the man who actually goes out and brings in business. It means team work, and team work of a concentrated kind. It means that the departments getting business through a personal contact with the public and by the printed appeal, keep an interest in what each other is doing. The advertising man who neglects to pay careful attention to the work of the salesmen is as much at fault as the salesman who does not keep track of the advertising campaign.

With divided responsibility for advertising, this co-operation can hardly be hoped for. Whether there is enough work to keep one man busy of not, some one man should be entirely responsible for the advertising. Well-directed effort can not be secured where there is conflict of authority. If no capable man who can give sufficient time to this branch of development work can be found within the organization, it will pay to get some one who has the ability and the knowledge to write copy that brings business—to direct the publicity methods of the company.

There can be no question as to whether it pays or not. Live copy properly placed will bring business. Circular letters with the right folders will put prospects on the path to better light and better power. The only excuse a station might feel for neglecting advertising would be that the field is fully developed. Yet it is doubtful if any field is fully developed—or ever will be. If it is, the same reason might be advanced for doing away with the business-getting organization altogether.

It is easy to see how a field might be over-developed at certain points, making the peaks higher, but the real valuable advertising, like other valuable new-business work is the kind that makes the peak extend over a longer period or brings up the valleys until they are paying profits. Improved diversity-factor, and more off-peak loads have been the rewards of companies that have intelligently worked and advertised. The two greatest off-peak loads, the ice-plant and the public garage, have been developed by many central stations. Many others are beginning to see that their load curves can be advantageously raised at a comparatively small expense. It is not entirely a matter of advertising, but it is advertising properly co-ordinated with salesmanship.

The matter of knowing just what to advertise and just when to push hardest can not always be settled by any one man. Again, conditions alter so rapidly, that at times any plan must be changed. Things arise that cannot always be foreseen. The sudden breaking down of a plant, shortage of an ice supply, or change of policy may demand immediate attention and may necessitate close co-operation of the advertising head with the heads of other departments. The "committee plan" of figuring out each week just what copy should be used the following week has a good deal of merit. It makes the advertising manager no less responsible and has the advantage of securing valuable co-operation. As valuable as the co-operation of these members of a committee, is the unified work of the men on the street or at the counter. If utensils are being pushed, or electric signs exploited, each man in the business organization should know of it. Whether the major part of his efforts are employed in other directions or not he can help make the campaign a success. This co-operation or lack of it decides the value of a vast amount of advertising. It can be secured only by advertising the campaigns or advertising matter within the organization.

A novel scheme of one company designed to make every one in the company employ read current newspaper advertising is to give a dollar to each employee finding a mistake. The amount, possibly, is small, but it does the work. The fact that very few mistakes made were not caught by some one speaks very well for the stimulus this action gave in the way of keeping the employees posted.

Thus every man in every department should, in some way, be made to feel an interest in the advertising—for every department has in a measure the power to greatly increase or perhaps entirely take away the value of the best publicity. Courteous treatment on the telephone, accurate information, prompt response in sending representatives to give estimates and adjust difficulties is essential. Above everything else the central station is selling "Service." Courteous treatment of the public by the employees is a feature worthy of much publicity—but it must be backed up by facts. The customer is quick to resent any such contradiction of advertised suppositions, and actual conditions. Discourteous answers to seemingly foolish questions would destroy the value of the most careful advertising or selling campaign ever planned.

The following extract is taken from the employees' handbook of a company operating a large central station. It throws some light on the causes for discourtesy in people undoubtedly courteous in their social life.

"An eminent physician, Dr. Cabot," says the booklet, "has called attention to a psychological fact which should be constantly kept in mind by those who have to do with public service, which he calls, 'The Illusion of Routine,' and describes as follows:

"You are perhaps an orderly, stationed in a certain part of a great institution to answer questions. People drift by your corner at such and such a rate and ask you questions, many of which are very foolish questions. Human nature being what it is, those questions come to be very much alike in any given month or any given year, and before you have been there very long you have been asked the same foolish question by at least a hundred people. The point to which I want to direct your attention is that when the hundredth man asks you a question which is no more foolish than it was when it was asked you the first time, your impression is, and you act upon it, that you have been asked the same foolish question a hundred times by the same man.

"In this connection, it should be remembered that questions which on the face appear to be foolish to those familiar with our business, are not foolish to the person asking them, and should be answered fully and courteously."

It suffices to say that where such advice as this is carefully and consistently followed, the point of service is well worth featuring in the newspaper advertising and such featuring is really "worth while" advertising.

The advertising manager who wants to put forward such friendly phrases as "Our experts are at your service," or

"An estimate will incur no obligation," should first find out whether the services of experts are really so easily had, and whether the prospect is actually made to feel no obligation through too close or too long a follow up. Even the most enthusiastic attempt to turn inquiries into actual business should stop short of the point where it becomes a nuisance.

When attention is directed one way keep it there—at least long enough to feel that the expense of getting further business in that direction is unwarranted. The first call on a man using an engine instead of a motor to drive his machinery might be entirely unsuccessful, but when that man has received booklets, figures, and perhaps a friendly letter or two he is apt to be in an entirely different mood. If his curiosity has been aroused, if he does not believe that electric drive can be so cheap, there is at least an opening for the solicitor to get down to "brass tacks" with him.

Like the valuable advertisement, the valuable campaign is one that not only directs attention in one way, but keeps out every diverting factor. One point at a time—the "bull's eye" method, very often succeeds admirably. At least the body of the advertisement, the main portion of the booklet, the principal part of the billboard, should hit hard. A few scattering shots, a line about electric service in general will do no harm and may get some results, but it should be secondary to the principal object of the campaign.

Contests among customers often bring good results and add interest and direction to a campaign. The Commonwealth Edison Company, of Chicago, at one time offered a washing machine as a reward for most closely estimating the saving made in a year by employing that machine in a small family. Attention to this contest was first aroused by circulars mailed to a large list. Later, newspaper advertisements appeared. Sheets folded and inserted in envelopes labeled "Washing Machine, Free" were distributed from points where electric light bills were payable. After the award was made, a follow-up advertisement in the newspapers announced the name of the winner, and the yearly saving possible with the use of an electric washing machine. In this case the contest was especially valuable as it directed general attention to the economy of the thing exploited.

The Denver Gas & Electric Light Company caught the public attention and directed it specifically in one direction for a month one summer; long enough to reap the benefits. Twelve groups of household appliances were made up, consisting of a vacuum cleaner, toaster and flat iron; vacuum cleaner, percolator and toaster, and so on. Each set was valued at $50. Coupons with a face value of eleven dollars to apply on the purchase of any set were then issued. In the circular sent out each set was well illustrated and described. To make purchase easier, installment payments were arranged for.

Keeping attention directed in one way for even so long a period as a month is no easy matter, yet if it be skillfully done it is almost certain of success if the scheme is a sound one. The many different media, the bulletin board, booklet, newspaper, circular and so on are so different in aim, and subject to such different treatment that the deficiencies of any one are made up by the good points of the others. Hammering steadily, aggressively with all of them, and explaining in every way, and from every angle how the reader will increase his income, or his comfort or cut his expense in some way can hardly fail to make an impression on a good percentage of the many who read the various messages. Co-operation, boosting and always presenting the best side and backing up advertising with facts is bound to win out.

Except in the advertising that makes an absolutely definite offer, it is too much to expect that the results will be immediate or that they will bring in a very large amount of new business. It is only in such cases, or where a campaign on house-wiring, store-window lighting, or something equally specific is being carried on that results can be traced at all. The inquiries come in; the solicitor is helped to a certain extent, and much valuable information is given out through booklets and newspapers. These might be called the primary results of advertising.

Test of Battery-Charging Equipment for Garage Shows High Efficiency.

In the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of January 1, 1916, there was described the electric garage of the Stroh Brewery Company, Detroit, Mich., in which are housed, charged and cared for a large fleet of electric trucks and delivery wagons used by this progressive company. It will be recalled that the charging current is supplied by the Detroit Edison Company as three-phase, 4,600-volt current at 60 cycles and this is stepped down in three Westinghouse single-phase transformers to about 148 volts; from the secondaries the current passes through two Allis-Chalmers 200-kilowatt rotary converters which supply the direct-current charging buses. The voltage of the direct-current circuit is regulated by means of a Westinghouse induction-type three-phase regulator which is connected between the supply source and the step-down transformers and serves to boost or buck the voltage supplied to the alternating-current end of the converter; thus the direct-current voltage can be varied during the progress of the charge from about 180 to 230 volts. The charging circuits are arranged as a three-wire system so that between either outside wires and neutral there is available 90 to 115 volts. This equipment has been operating with complete satisfaction.

A test was made in this garage a short time ago to determine the over-all efficiency of the entire charging equipment from the Edison supply cables to the direct-current battery-charging buses. This test was made by the input-output method for the sake of simplicity. The input was measured by two induction wattmeters connected to the high-tension service leads through current and potential transformers. The output was measured by two direct-current switchboard ammeters and by the station voltmeter. During the test the neutral was disconnected, so that the two ammeters read in series and therefore gave an excellent check on each other. The probable accuracy of the test was within one per cent. The load was kept constant and was obtained by the use of five water rheostats connected in parallel which thus corresponded exactly with the storage batteries of the trucks. By the use of the potential regulator the charging busbar voltage was varied from 179 to 226 volts corresponding to charging voltages between outside leads and neutral of 89.5 to 113 volts. Readings were taken at practically full load and at different voltages with the following results:

Direct-Current Voltage.	Input Kilowatts.	Output Kilowatts.	Actual Efficiency Per cent.
179	173.3	153.9	88.8
190	180.9	161.1	89.0
199	187.2	169.1	90.3
209	198.7	177.6	89.4
211	200.1	179.4	89.6
220	209.3	187.0	89.3
226	212.6	192.1	93.0

These efficiencies correspond almost exactly with the guaranteed efficiencies of the equipment. They also show the very high efficiency obtained by the use of such battery-charging equipment in comparison with the more common method of using motor-generators. The tests were made by Fred J. Postel & Company, Fisher Building, Chicago, who designed the installation.

POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

MOTOR DRIVE IN THE MANUFACTURE OF MACARONI.

Details of an Interesting Installation in Denver.

By Frank D. Burr.

An industry which has had a very rapid growth in Denver, is that of the Denver Macaroni & Noodle Company. The sales of macaroni in its various forms have been

Motor-Driven Kneader and Presses in Macaroni Factory.

remarkably increased by the above company, which has educated all classes of people to the advantages obtained from its numerous uses.

The manufacture is commenced in the basement of a two-story building where a 15-horsepower 220-volt three-phase motor running at 1,130 revolutions per minute drives a macaroni dough mixer, kneader, three macaroni presses, a dough brake and noodle cutter. These machines are shown in the accompanying illustrations.

The mixer is in appearance a vertical cylinder containing a volume of 75 gallons. In the center is driven a vertical shaft, through the center of, and at right angles to which is fastened steel rods, spaced eight inches apart, which are at right angles to each other and of sufficient length to nicely fit inside the cylinder. When the shaft rotates, the steel rods pass midway between similar rods, fastened at the inside of the cylinder. Flour and water is poured into the mixer of sufficient amount to make 100 pounds. The mixture being formed into a dough is continually turned by being forced between the steel rods and in this way it is possible to get the best effect of the starches and glutens after a mixing of ten minutes.

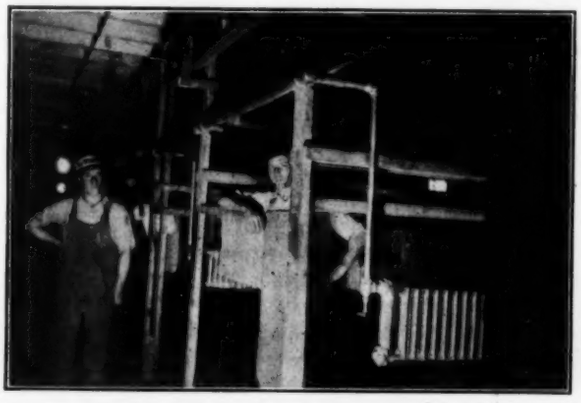
All old country people demand that the macaroni be made of macaroni wheat, called Durum. The flour produced from this wheat is granular, resembling fine white corn meal. When noodles are made eggs are added to the mixture.

After the paste is thoroughly mixed the dough is placed in the kneader where it is worked for fifteen minutes. This consists of a revolving pan, four feet in diameter at the side of the mixer, in which revolves at diametrically opposite sides the conical rollers, one of which is corrugated, the other plain. The dough passes under the corrugated roller, thus working it into a series of undulations, and after being pasted around beneath the other roller which is smooth, it again works the dough, flattening out the undulations. Just before the dough reaches the corrugated roller again a plow share scrapes the dough from the bottom of the pan, standing it on edge so that it runs under the corrugated roller in that position and thus continues until properly worked. The dough is then cut into suitable cakes so as to be readily forced into the cylinder of the macaroni press.

The press consists of two vertical cylinders, one of which is being filled with dough while the power-driven screw press pushes the dough through the macaroni die at the bottom of the other cylinder. The cylinder being loaded is packed with the dough being pushed into a homogenous mass by putting in one layer at a time and forcing it together by means of a hand-driven screw press.

When the flexible macaroni tubes have issued below the die into lengths of about 40 inches they are gathered together by the operator of the machine and cut off at the die. They are then folded over one of the drying sticks, four feet long by three-fourths of an inch in diameter, and adjusted to one layer in depth so that they may readily dry. The ends below the stick are then trimmed by means of cloth-cutting shears to a length of 19 inches and are then carried to the fan room and placed on racks so that the sticks are parallel in racks at a distance of six inches apart.

The macaroni is left in the fan room for one hour, when it is properly dried.



Drying Room Equipped with Fan.

The fans consist of blades or paddles 36 inches long clamped at the middle to a horizontal revolving shaft 15 feet long. The blades are fastened at right angles to each other one foot apart. A line of steam radiators extends below the entire length of each shaft, the steam being supplied by a small steam-heating plant operated at 15 pounds pressure. Four of these fans are belted to a

5-horsepower 220-volt three-phase motor running at 1,800 revolutions per minute. There are three similar sets of fans and motors.

After being dried the sticks are taken from the racks to a truck and taken to the damp room where the macaroni is kept for three hours. Brick stalls are built in this damp room, four feet in width, so that the macaroni sticks can be arranged there symmetrically and parallel.

Just previous to the placing of the macaroni, the brick walls covered with burlap, are sprinkled with water. After the macaroni has been placed it is covered with a cotton blanket to retain the dampness.

After the macaroni has become damp and pliable again it is returned to the dry room where it is dried out in an hour and a half. It is then again taken to the damp room where it becomes damp and pliable in another three hours, after which it is taken up stairs on the elevator which is driven by a five-horsepower 220-volt three-phase motor running at a speed of 1,700 revolutions per minute, where it is dried for about a week. It is then taken to the packing room where it is cut into suitable sizes for packing by means of a cross-cut saw, driven by two-horsepower 220-volt three-phase motor, 1,800 revolutions per minute.

Spaghetti is produced by the same process excepting that the dough is forced through dies having smaller holes and vermicelli is produced by forcing through dies having much smaller size holes.

Elbow cuts, which are short pieces to be used in soups and stews, etc., are made by means of a knife revolving below the die of the macaroni press, at such speed that it makes one revolution by the time the macaroni has been pressed through about an inch in length; these pieces are then collected into a canvas bottom pan and taken to a fan room where it continues in the same process as the other macaroni.

Over 1,200 tons per year are produced by this factory,

Noodle Cutter and Other Motor-Driven Machines in Macaroni Factory.

the sales force of which distributes the output from Montana to Mexico and from the Pacific coast to the Missouri River. This product complies with all of the regulations of the pure-food law, containing no adulterations or coloring matter and the factory is kept thoroughly sanitary and clean because of the use of electricity.

Large Power Contract with Gas Company.

The Merchants' Heat & Light Company, Indianapolis, has closed the largest power contract ever closed by a central station in that city. The contract is with the Citizens' Gas Company and calls for $30,000 annually for the use of power. Heretofore the isolated plants of the gas company have provided their own power.

SECURING POWER BUSINESS FROM LARGE FACTORIES.

Louisville Company Takes Advantage of Every Opportunity to Establish an Entering Wedge and Then Has Systematic Follow-Up.

It is often true that the power salesman will come to the conclusion, when he considers a big factory with a large and well-equipped steam plant, that there is no chance for him to do any business there. The same situation applies in a large measure to the enterprises which are generally considered to be closed doors to the power man, where necessity of disposing of waste or requirements in the way of heat, or steam or water seem to make electricity —at least central-station service—out of the question.

In many such cases, naturally, it is an impossible chance that the power salesman can interest the owner in a proposal to throw out his elaborate steam and transmission equipment and adopt central-station service. Even when a new project is being built from the ground up the power salesman will usually find that he is encountering real opposition from representatives of the older systems. One way to capture a city is to overwhelm it all at once. This is sometimes a good way, although again it is often undertaken at prohibitive cost in life and endeavor. Another way to capture a city is to send one hardy scout over or through or under the wall in disguise and have him blow up the arsenal and spike the cannon. Then the rest of the army simply walks in and occupies the place.

So when the proposition in the aggregate looks like a forlorn hope or when it is a forlorn hope, there is very often a good opening in the wall through which the power salesman can send his scout. Then he has driven an entering wedge. He has a good thing and sooner or later he will, if he keeps pounding on the wedge, drive a bargain that means a big order and constantly increasing business. Or even if he can get no further than the original contract, there is every reason to conclude that all the other "hopeless propositions" on his books will offer him similar opportunities, and in the aggregate that kind of business is worth going after.

Opportunities in Flour Mills.

There is an instance of this kind to be noted in Louisville, Ky., where a big milling company which two years ago was scarcely on the books of the Louisville Gas & Electric Company is now a customer with an aggregate consumption of about 35,000 kilowatts a month. The company is the Ballard & Ballard Company, flour millers, with one of the biggest milling plants south of the Ohio River and with a modern, efficient and well operated steam power plant of 1,400 horsepower, which is still running and has an expectancy of a long and useful life. Coal for steam purposes is very cheap in Louisville, and there is a spur from the main line of the Louisville & Nashville railroad which runs into the plant.

A year and a half ago the Ballard & Ballard Company found that it would require additional power. At this mill, as at all others, there is a proportionately large accumulation of waste which is cleaned from the grain before it goes into the flouring process. This had been disposed of in one way or another without showing a profit of any importance. The management of the company determined to put into operation a machine which reduces this waste to a high grade feed, at the same time grinding the weed seeds so that there is no possibility of their getting back to the land. This machine was to be erected at a point where it would be rather inconvenient to reach with a shaft or belt.

At length the company decided on electricity and had even purchased a generator which was to be belted to the steam engine. That, however, was when the representatives

of the Louisville Gas & Electric Company got in their work. It was not that the generator in itself was not all that could be required, but the position of the company's representatives was that since the new machine was more or less experimental, since this generator would have had to be supplemented later and since by the means proposed electricity would hardly get a fair trial, central-station equipment was what was wanted.

In due course the new feed-grinding machine was put to work, connected to a 25-horsepower motor. That was a year and a half ago. The machine proved itself. Now, ranged by the side of it are six other machines of identical construction each operated individually by a 25-horsepower motor. This one item offers a practical and concrete suggestion for the power salesman, for milling plants are everywhere and many of them are so rich in the waste they accumulate that they could be directly served by addition of such equipment to their plants. The fact that the waste is often discharged, also, at a distance from the power plant suggests also that electric drive could be provided for in numerous cases.

About the time that the trial was made with the first grinding machine at the Ballard & Ballard mills the city was finishing a large undertaking in the way of improving Beargrass creek, which flows past the mills and from which the plant gets its condensing water. These improvements included deepening and straightening of the channel, until the head of water is lowered and it became necessary for the company to pump its water. Once having discovered the advantages of electricity by actual use the company installed a centrifugal pump about 200 feet from the boilers and connected it to a 40-horsepower motor.

The creek named is sometimes subject to floods, although this objection is being largely done away with through the improvement the city has made. Still there are likely to be times when the water will break its artificial bounds, as it used to break the natural bounds. In former years the company found it necessary to keep steam up at flood times so as to be able to operate a pump located at the lowest point in the plant. Now this danger is amply taken care of by a pump at the low point, to which a 30-horsepower motor is connected. It is all ready to operate by the simple process of throwing a switch. Like other flouring mills this one operates more or less intermittently. Now, whatever the water danger, there is no need to keep steam up for possible pumping. It may be noted that in the year and a half this flood water pump has not been needed once.

A city block or more distant from the main plant of the company is the warehouse, additional storage and elevator accommodations, etc., where a year and a half ago a separate steam plant was maintained to operate the various equipment requiring power and, also, to pump the water from a deep well for the boilers of both plants. This was not such an elaborate plant, naturally, and its cost was rather heavy. One of the next steps was to throw it out altogether. Now there are 125 horsepower of electric motors connected up in this warehouse building and in addition still another 40-horsepower motor drives the deep-well pump.

Like other industrial enterprises the management of this company is always on the lookout for opportunities to extend business. In former years all of the product of the big plant was packed into barrels or into bags. The demand for flour, plain or prepared, special kinds of flour, etc., packed in pasteboard cartons, has been increasing, especially under the influence of the prevailing high prices on flours, and the Ballard & Ballard Company determined to go after some of this business. There were no facilities for operating such a department under the existing arrangement. Power and equipment were needed. Now the carton department has two 10-horsepower motors, one 15-horsepower motor and one 20-horsepower motor, driving packing machines, conveyors, etc.

Eventually, of course, the Ballard & Ballard plant will be changed over altogether to the electric drive, as will other manufacturing plants. This record of additions to the power to the advantage of electricity certainly shows that the business which has resulted in the short space of a year and a half, will increase as time passes. It all started from the first installation. The bulk of the selling was done then. When he drove the entering wedge at this plant the representative of the Louisville Gas & Electric Company started something. How worth while it is can be determined from the volume of consumption.

The Axton-Fisher Tobacco Company, a new plant, operating electrically but with an isolated plant, has also been added to the power customer list of the local central-station company. Steam and water are essentials in tobacco handling. If the leaves become dry and shatter they are gone. This was a case where more power was needed and where in order to get it unaided the isolated plant would have had to be extended. Still no more steam or water was required. The requirements do not balance that well in a tobacco factory, nor in many other power-using plants.

A recent lumber publication advocated installation of motor-driven equipment in some cases and instanced the application of the principle to a cut-off saw. Lumber mills, with their excess of waste, are usually deemed impossible. Here is a way to make a beginning. The cut-off saw is the one which works at right angles to the grain of the lumber and is used to even boards and reduce slabs to chunks. The lumber expert makes the observation that the great bulk of woodworking operations are performed on the material while it is in motion and traveling in the direction of its length. Cut-off operations, on the other hand, offer a distinct retarding effect upon the movement of the stock through the factory, as the material is momentarily held up during the time the saw passes across the board.

Not only is this true but the fact that the arbors of the surfacing machinery and the cut-off saws must necessarily operate at right angles, requires that the latter be driven at right angles to the main driving shaft through a quarter-turn belt or other device, or the installation of a motor-driven unit. This writer advocated installation of the cut-off saw out of doors, on the conveyor, and points to the desirability of the electric drive.

Electric Shovel at Coal Mine Shows Economy Over Steam.

A half-dozen or more big-type electric shovels are now building or have been contracted for in coal-stripping operations, on the strength of the showing made by a pioneer installation since the first of the present year. Mention was made several months ago of such equipment being installed by the Piney Fork Coal Company, of Columbus, O., at its mining operations in the Pittsburgh No. 8 seam, near Steubenville, O.

The Piney Fork plant went into regular commission in January. Its performance has exceeded the hopes of the company which made the experiment. The daily power expense under normal conditions has been less than that estimated for steam. It is a curious fact that a shovel engaged in coal production and standing upon a seam of coal, no farther away than the length of the boom, cannot utilize this fuel for its own operation as cheaply as it can supply itself with electricity generated—as in the case of the shovel in question—30 miles away. A large expense of the former is that of getting the coal from the seam to the shovel. The shovel being necessarily portable, no permanent device can be constructed. With electricity the energy is secured from a near-by transmission line and connected in a few minutes.

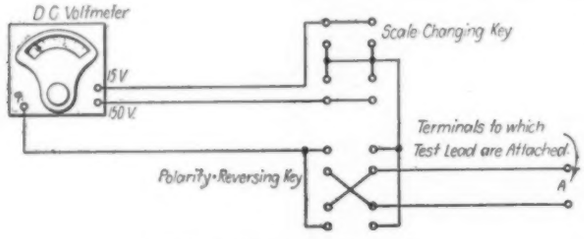
ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

A METER CARRIER, A HANDY CONTRIVANCE IN ELECTROLYSIS SURVEYS AND TEST WORK.

By L. E. Darling.

In electrolysis surveys, cable tests, and similar work, it is usually necessary to carry a voltmeter from place to place to get test readings. The ordinary method of transporting the meter is to have it incased in a small wooden frame and hung by a strap to the shoulder. At each manhole the meter must be unslung, laid flat on the ground,



Wiring Diagram of Meter Box.

in dust or mud as the case may be, and connected up with the test leads running to the cable or other object under investigation.

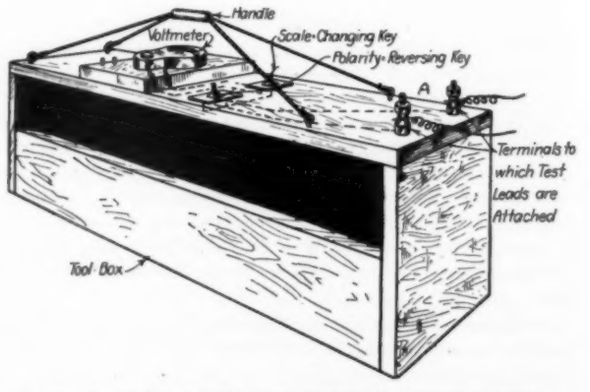
All this is time-consuming and laborious, as well as hard on the meter's mechanism. In addition, frequent connecting up of wires speedily results in the ruin of binding posts. Frequently the leads have to be reversed after once put on, for the reason that the meter is reading in a backward direction. Then again, if the meter has more than one scale, further manipulation is necessary to connect up to that one best fitted for the voltages under observation. If the streets be crowded, passing horses are likely to step on the meter in its unprotected position adding still further to the troubles. If too much time be consumed in the various manipulations, the operator is likely to bring down the wrath of the corner policeman at the obstruction of traffic he is causing. Altogether the arrangement is unhandy and inefficient.

To obviate these difficulties, investigators working on an electrolysis test of telephone cables recently devised a meter carrier which proved decidedly practical and convenient in use. A long narrow box was obtained, to one end of which the meter was attached. The sheer size of the box, about 30 inches long by 8 or 10 inches high, was sufficient to attract the attention of passing teamsters, and to keep them from guiding their horses into it while the operator was down in a manhole or otherwise engaged. To eliminate the necessity for changing wires about on the binding posts of the meter, two double-throw switches were installed. Since a voltmeter takes but a very small current, the kind of switch used on a telephone board known as a "ringing and listening" key, was found to be particularly satisfactory for this purpose, and better than heavy knife switches which might have been used.

The two keys were connected in on the meter circuit as shown in the accompanying diagram. One key served as a "polarity reverser," and the other as an agency for bringing into play either one of the voltmeter's two scales at will. At the opposite end of the box two heavy binding posts were securely attached, these serving as anchors for wires which led from the meter box down into a manhole or other locality being tested. As can be observed from the diagram, the wiring circuit leads from these two posts, through the polarity and scale switches and thence to the meter.

In use, the test wires were left permanently attached to these heavy binding posts, eliminating entirely the necessity for pausing in the middle of a crowded thoroughfare to connect up the meter. All that was necessary was to connect up the loose ends of the wire to the cable being tested and proceed with the readings. If the meter read backward, the trouble was promptly remedied by throwing the polarity-reversing key over to the other side, causing the meter indicator to move over the scale to the right as it should. If the high-reading scale of the instrument proved too large for the voltages encountered, the other could immediately be brought into play by moving the scale-changing switch. Ease of manipulating the keys in this manner was a particularly handy feature in neighborhoods where voltage fluctuations were large. Quick moving of the keys would enable the operator to keep up with the changes as fast as they occurred.

The box with meter attached was easily transported from place to place by means of a handle composed of four pieces of wire attached to convenient points on the framework. The interior of the box proved a convenient receptacle for pliers, screwdrivers, and such tools, as well as tape, rolls of wire, and record books needed in the work. With this arrangement the bottom of the box got all the knocks which the meter would ordinarily receive if carried around alone and laid flat on the ground, as was formerly done.



Handy Meter Carrier with Wiring for Making Tests.

Passersby, whose feet sometimes got tangled up in the leads running to the object being tested, worked no injury to the meter itself, for the heavy binding post at the end of the box caught all the strain due to accidental pulls. Throughout three months night and day use the apparatus proved entirely practical and a timesaver.

Alternating-Current Motor Windings—II

By Justin Lebovici

This is the second installment of a series of articles dealing with the windings of alternating-current motors. The present article deals with winding diagrams and single-phase windings. Subsequent articles will discuss wave connections, lattice connections, skein windings, polyphase windings of open and closed types, mechanical construction of windings, etc.

Arrangements of Conductors.

In most low-voltage machines and machines of industrial sizes a slot arrangement of conductors is employed that is shown in Figs. 18 and 19.

In this case the conductors *T*, lying nearer the bottom of the slot, form part of one coil and the conductors *B*, nearer the top of the slot, form part of another coil. Where many small conductors are required the arrangement shown in Fig. 18 is commonly used; the wires *W* may be round or rectangular. If the wires *W* are in series, round wire is to be preferred, as

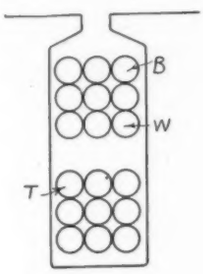


Fig. 18.

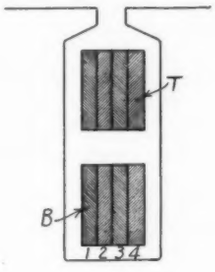


Fig. 19.

square wire easily twists, resulting in short-circuited coils. In case the wires *W* are small and the wires are not arranged to form layers, we speak of promiscuous or mush winding. The rectangular wires wound *on edge* in Fig. 19, or *flat* in Fig. 20, utilize very efficiently the slot space and have the only drawback that special dies are required to draw the conductors and this copper cannot be obtained on the market at short notice.

The arrangement of conductors shown in Figs. 18 and 19 is known as *double-layer winding* to distinguish it from the arrangement shown in Fig. 20, used in induction motors operated at high voltage or in alternating-current generators.

The arrangement of wires shown in Fig. 21 is sometimes used in small induction motors having so-called *basket* and *skein* winding, a subject to be treated when the different types of windings are discussed.

The wires 1, 2, 3, 4, in Fig. 19, for instance, will be considered, depending upon the case, either as one coil-side, or as four coil-sides of four distinct coils lying in the same slot.

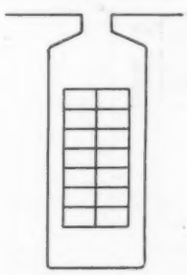


Fig. 20.

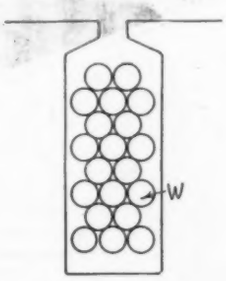


Fig. 21.

The arrangement of conductors in concentrated field coils, as shown in Fig. 22, is self-evident and needs no further explanation.

The insulation of the conductors from each other and from the slots or ground will be taken up separately.

Winding Potential Diagram

A better understanding of the connection diagrams, to be described, will be had if the winding potential diagram is thoroughly understood. Fig. 23 represents a bipolar field which may be excited from a source of direct current. *AB* represents an armature coil moving with the armature in the direction of the arrow *v* at a constant peripheral speed *v*.

The distribution of the flux around the armature periphery in a direction perpendicular to the conductor is given by Fig. 24 and is assumed to be a sine-shaped curve.

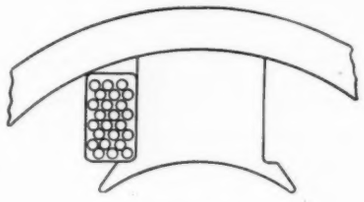


Fig. 22.

The abscissa M_1N_1 in Fig. 24 is proportional to the length *M A N* in Fig. 23 and represents the pole pitch, as explained previously. The ordinates *B* in Fig. 24 represent intensity of the field in maxwells per square inch in a direction perpendicular to the conductor *A* when the same takes the different positions from *M* to *N* and back to *M* in Fig. 23.

Suppose that we call zero the time when the conductor *A* coincides with *M* in Fig. 23 and that *t* seconds later it occupies the position *A* shown in Fig. 23. If the line *OA* describes an angle ω degrees in one second, then in the time *t* it will have described the angle ωt and the angle *MOA* equals ωt degrees. The

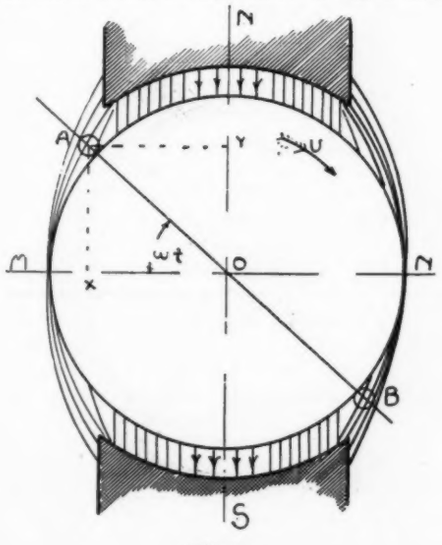


Fig. 23.

distance M_1A_1 in Fig. 24 is made to correspond to the angle ωt, and B_A corresponds to the intensity of the field at the point *A*.

Since we assumed that the curve in Fig. 24 is a sine curve, we have

$$B_A = B_{max} \sin \omega t.$$

The electromotive force (e) induced by the rotation of the conductor A in the field is at every instant proportional to this field, proportional to the active length (l) of the conductor and proportional to the constant peripheral velocity (v), or, for the instant shown in Fig. 23,

$$e_A = B_A lv = B_{max} lv \sin \omega t = \text{constant} \times \sin \omega t,$$

and since the line $AX=OY$ in Fig. 23 is proportional to sin ωt, it also represents the voltage generated in the conductor A at every instant.

Noting that sin ωt is a value which varies between 0 and 1,

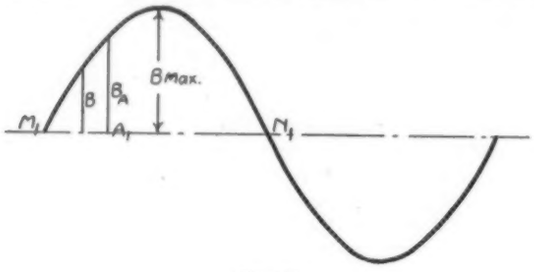


Fig. 24.

it is at once apparent that the constant $B_{max}lv$ in the last equation corresponds to the maximum instantaneous voltage generated in the conductor A in its travel around the armature and we will mark this value e_{max}. Then the equation can be written

$$e_A = e_{max} \sin \omega t.$$

e_A becomes equal to e_{max} when OA coincides with the center line of the magnetic poles, NS in Fig. 23.

If we draw a line PP perpendicular to AB and equal to e_{max}, as is done in Fig. 25, we see that since the angle PPP_1 equals angle AOM or angle ωt, $PP_1 = P_2P_2 = e_{max} \sin \omega t$, or the *projection of PP on the horizontal line MN gives us the instantaneous value of voltage generated in the conductor A for any position of A relative to the poles NS.* The instantaneous value P_2P_2 (or e) in Fig. 25 becomes equal to $PP = e_{max}$ when during the rotation of A the line PP becomes parallel to the horizontal MN, or in other words when the conductor A travels under the center of the pole. We will apply the above to the case of the ring-wound armature shown in Fig. 26.

Assume the armature to carry six conductors; the voltage induced in each of these conductors is given for any position

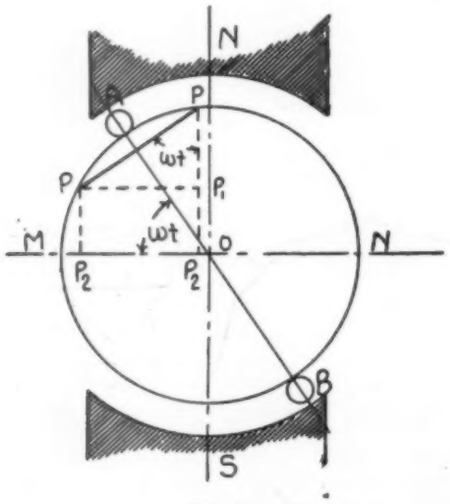


Fig. 25.

of the armature by the projection of the lines e_1, e_2, etc., on the horizontal, as shown in Fig. 27. All six conductors are represented as connected in series in Fig. 26. Arrows b in Figs. 26 and 27 correspond to each other.

The voltage generated in conductor 1 at the instant shown in Fig. 26 is given by the projection AB_1 in Fig. 27. The maximum voltage or the amplitude of the voltage generated in conductor 1 is given by the line AB.

The amplitude of the voltage generated in conductors 1 and 2 when connected in series is given by the line AC in Fig. 27. The instantaneous value for the position shown in Fig. 26 is given by the line AC_1. The amplitude of the voltage generated in conductors 1, 2 and 3 in series is given by the line AD in Fig. 27. Similarly the line AE represents the maximum value of the voltage induced in conductors 6 and 5 in series or in conductors 1, 2, 3 and 4 in series.

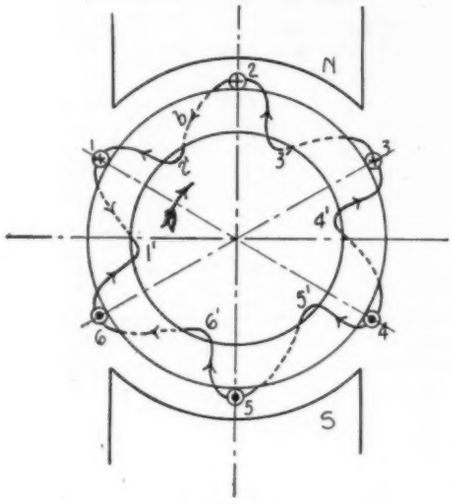


Fig. 26.

For the instant shown by Figs. 26 and 27 the voltage of conductors 1, 2 and 3 in series is equal to AD and is a maximum, the voltage of 1 and 2 in series is equal to AC_1 and is smaller than AC. After the armature has turned further through an angle ωt_1 (shown in Fig. 27) the voltage in 1 and 2 will have reached its maximum value. We express this by saying that voltage e_1 e_2 reaches its maximum later than e_1 e_2 e_3, or the voltage AC *lags* behind the voltage AD by an angle $\omega_1 t_1$. Similarly AD reaches its maximum $\omega_3 t_3$ degrees later than AE and we say that AE *leads* AD by an angle $\omega_3 t_3$. The angle $\omega_1 t_1$ is called the angle of phase difference, or simply the *phase difference* between the voltages AC and AD.

If the points 1′, 2′, 3′, 4′, 5′, 6′ in Fig. 26 would be brought to the segments of a six-bar commutator, the voltage AB, AC, etc., in Fig. 27 could actually be measured around the commutator by means of a voltmeter. The diagram shown in Fig. 26

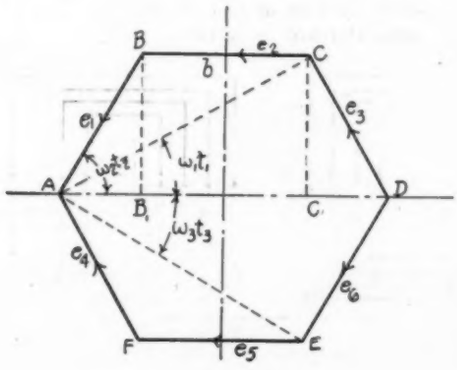


Fig. 27.

gives us the potential between the various points around the commutator, and hence the name of potential diagram or winding potential diagram.

Let the points 1′ and 4′ be brought to two slip rings and the voltage between the slip rings be read at instants correspond-

ing to the different positions of the points 1′ and 4′ with reference to the stationary poles *NS*. The projection of the line *AD*, Fig. 27 (which we imagine revolving with the armature) on the horizontal gives us then the instantaneous voltage between the slip rings. This voltage is a maximum when the points 1′ and 4′ are in the position shown in Fig. 26, and equal to the line *AD* in Fig. 27. When the points 1′ and 4′ have

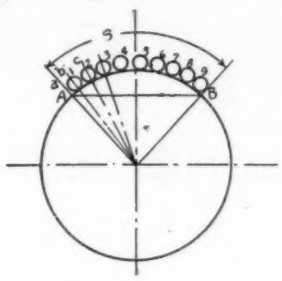


Fig. 28.

moved to a position corresponding to the axis of the poles *NS*, the projection of *AD* on the horizontal is zero and the voltage between slip rings is zero.

The electromotive force generated between points 1′ and 4′ is an alternating voltage.

It is evident from Fig. 27 that the maximum voltage of conductors 1 and 2, or *AC*, is smaller than the sum e_1+e_2. The ratio

$$AC/(AB+BC)=f_w$$

is called the winding-factor and is a quantity always smaller than 1.

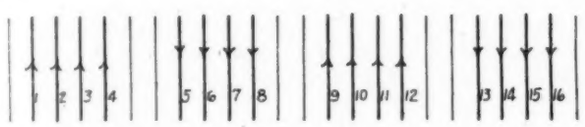


Fig. 29.

Assume now the conductors to be closely spaced, as shown in Fig. 28, then the chords a_1b_1, etc., representing the maximum values of the voltages generated in the different conductors 1, 2, ... 10, coincide with the small arcs *ab*, *bc*, etc. The total voltage generated in the conductors 1 to 10, if connected in series, is equal to the chord *AB*, while the arithmetical sum of the voltages e_1, e_2 ..... e_{10} is represented by the arc *S*. The winding-factor or breadth coefficient

f_w=length of chord *AB* divided by length of arc *S*.

The winding-factor of the group of coils uniformly distributed over half the circumference of a two-pole armature is the

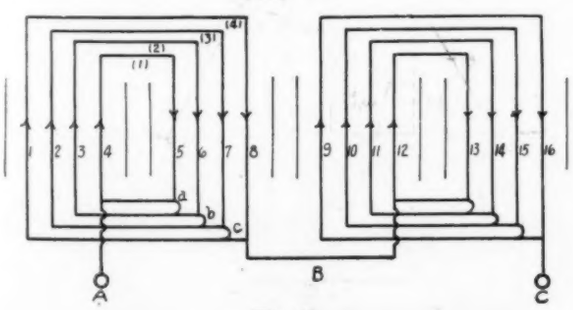


Fig. 30.

ratio of the diameter of the circle to half the circumference, or

$$f_w=2/\pi=0.637.$$

Calling the spread of the coil *S* (see Fig. 28), then we have for different ratios of coil spread to pole pitch the following winding-factors.

WINDING-FACTORS FOR UNIFORMLY DISTRIBUTED WINDINGS.

S/τ	1/6	1/3	1/2	2/3	1
f_w	0.988	0.955	0.90	0.827	0.637

Single-Phase Windings.

Generally in a single-phase winding only a part of the total slots in the pole pitch are filled with conductors. It is com-

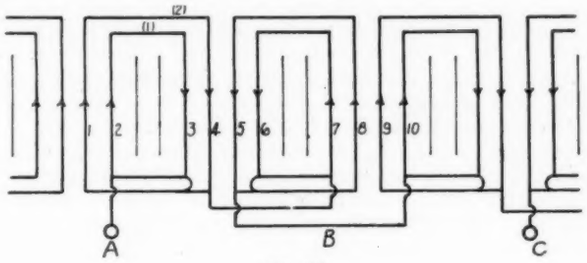


Fig. 31.

mon to wind two-thirds of the slots in the pole pitch, although any other fraction and even the full pole pitch may be used for winding.

Assume the conductor diagram shown in Fig. 29, which represents the diagram for a four-pole machine with six slots per pole pitch, two-thirds of which (or four slots) are wound.

Fig. 32.

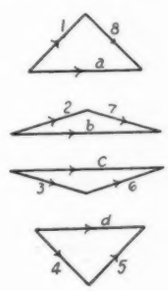


Fig. 34.

We may connect any one conductor passing under a north pole to any one conductor passing under a south pole. The following end connections are more commonly found in single-phase practice:

(a) Concentric connections.
(b) Wave connections.
(c) Lattice connections forming wave or lap windings.
(d) Skein windings.

Concentric Connections.

To connect conductor diagram shown in Fig. 29 to a concentric winding, we proceed as shown in Fig. 30, which shows one way of connecting the conductor diagram Fig. 29 to a concen-

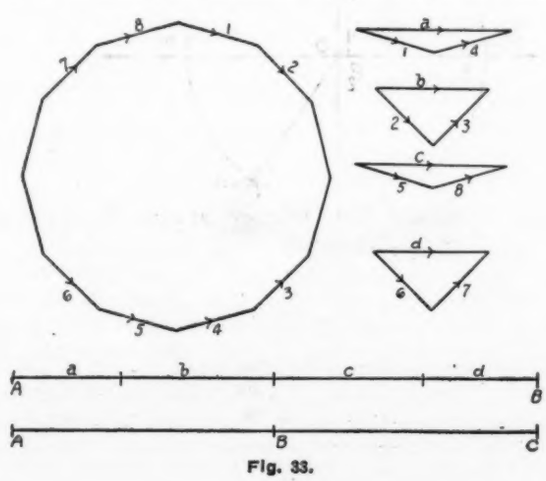


Fig. 33.

tric winding. The winding shown in Fig. 30 requires in the case of a wire coil, four coil forms and the brackets have to accommodate four winding ends. *a, b, c* indicate the cross connections between coils (1) (2) (3) (4).

Fig. 35.

It will be found more advantageous to connect the conductor diagram Fig. 29 to the concentric winding shown in Fig. 31. In the case of more than one-turn coils only two forms would be required and the brackets would have to accommodate only two winding ends (1) and (2).

In Figs. 30 and 31 all the conductors have been connected in series between the leads *A* and *C*. The winding potential diagram for Fig. 30 is shown in Fig. 32 for the two poles utilizing conductors 1 to 8. The potential diagram for conductors 9 to 16 is identical with the one for conductors 1 to 8. Voltages

Fig. 36.

1 and 8, 2 and 7, 3 and 6, 4 and 5 combine as shown in Fig. 34. The voltages shown in Fig. 34 combine again to the resultant voltage shown in Fig. 35, where *AB* is the resultant of the voltages generated in the conductors 1 to 8.

An equal voltage is generated in conductors 9 to 16; the line representing the voltage *BC* is equal and parallel to *AB* (see Fig. 36). The amplitude of the voltage generated between the leads *A* and *C* is given by the line *AC* in Fig. 37, drawn to a different scale than Figs. 35 and 36.

In Fig. 34 the lines 1 to 8 are equal and parallel to lines 1 to 8 in Fig. 32. In Fig. 35 the lines *a, b, c, d* are equal and parallel to lines *a, b, c, d* in Fig. 34. The voltages 1 to 8 and *a* to *d* are simply added geometrically like forces.

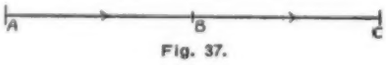


Fig. 37.

The winding potential diagram for two poles of the winding shown in Fig. 31 is given in Fig. 33. The total resultant voltage is the same as for the connections shown in Fig. 30. In fact the resultant voltage is independent of the connection diagram and only dependent upon the conductor diagram, Fig. 29, as long as the conductors are so connected that the arrows follow each other without bucking each other. Fig. 33 is similar to Figs. 32, 34, 35 and 36 and needs no further explanation.

(To be continued.)

Electrical Wiring on River Boats to Be Modified.

Contractors for electric lighting have found their prospective business extended and are following up the new order of the United States Department of Commerce relating to the character of electric-lighting equipment on boats which ply the rivers. The order provides that electric-lighting installations on all vessels contracted for after June 30, 1916, must be in keeping with the best modern practices. It is argued by some contractors that the same provisions should be carried out by the owners of older boats.

Code Standard for Wiring in the Northwest.

A proposed new electrical ordinance introduced at the suggestion of the Washington Surveying and Rating Bureau is before the city council of Puyallup, Wash., at this time. The ordinance—which is much more stringent than the one now in use—provides that all work must conform to the National Electrical Code; that a permit be taken out for every job; and that a fee of $1 or more must be paid for inspection. According to reports, there is considerable opposition to the proposed ordinance because of the heavy cost of installing small jobs.

All-Metal Conduit Requirement Satisfactory in Louisville.

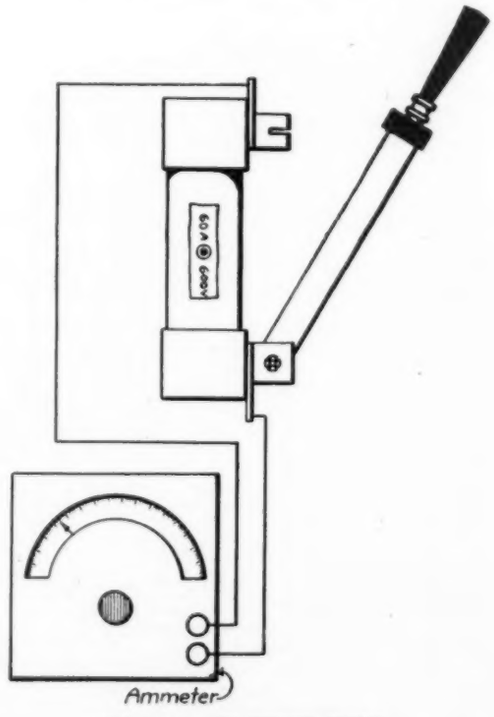
After nearly two months of operations under the new building regulation by which wiring installations in Louisville and Jefferson County, Ky., are required to be all-metal-conduit construction, the contractors of the city report that things are working out exactly as had been expected and that they are well pleased with developments. Business lagged for a time after the new regulation went into effect, but that is stated to have been due largely to the fact that contractors were busy executing orders received in the rush before the first of May. The manner in which the electrical contractors in Louisville and the civil and insurance officials have worked out a plan of co-operation has been attracting attention in other parts of the state and it is stated that in the near future representatives of the Louisville trade will go to Lexington where an Electrical Clearing House will be organized among the contractors of that city, in the interests of standardization of the work.

HANDY CURRENT-TESTING DEVICE.

By W. Morris.

A very convenient testing device can be made from the body of an old blown-out cartridge fuse, to the ferrule ends of which the hinge and clips of a knife switch are securely soldered. Secured to the switch terminals there should be flexible wires of sufficient current-carrying capacity to permit making the test on the circuit. These wires are connected to an ammeter.

This device is especially handy when it is necessary to test a lot of motors in a shop. All that it is necessary to do is momentarily to short-circuit one of the fuses by putting a jumper around its terminal clips, then pull out the fuse and in place of it insert the device shown. Now by opening the switch the current taken by the motor will be read on the ammeter and this without interrupting



Handy Current-Testing Device.

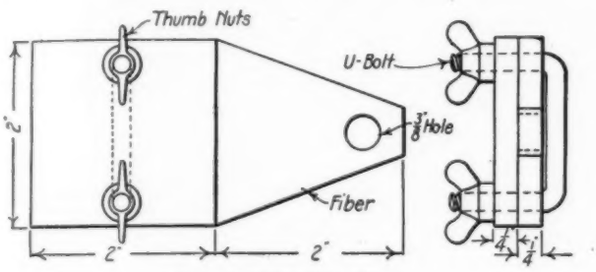
the operation of the motor at all. When ready to replace the fuse, first short-circuit the terminals again, then pull out the testing device and put the fuse back before removing the jumper.

DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

A Handy Armature-Banding Vice.

A convenient little vice for holding the wire used in banding an armature can be made as shown in the accompanying sketch. It is made of two pieces of fiber, the lower one of which has an extension with a hole through it. By tying a piece of wire or rope through this hole, it can be



Armature-Banding Vice.

secured to any convenient part of the lathe or motor frame. By using a U-shaped piece of rod threaded on each end as a U-bolt, the thumb nuts will not readily become loosened. Any desired tension can be put on the wire by tightening these nuts.

R. L. Hervey.

Plugging Holes in Slate Switchboards.

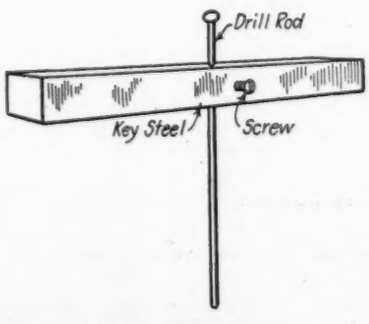
I had an old slate switchboard to repair. The repairing consisted of remounting an ammeter and a voltmeter and removing a battery rheostat. This work left a number of holes in the board which spoiled its appearance. I filled the holes with a mixture of one part plaster of paris and two parts black putty, which gave the board a very good finish, the old holes being inconspicuous.

M. J. Moriarty.

Simple Depth Gauge.

A very convenient depth gauge can be easily made from a piece of five-sixteenths-inch square key steel about three inches long, which has been carefully trued on the long sides. Drill a one-sixteenth-inch hole in the center of this piece and at right angles to it from the adjoining side drill and tap for a No. 4-36 machine screw. Take a piece of one-sixteenth-inch drill rod about six inches long, slip it through the hole and tighten it with the screw.

F. A. Grohsmeyer.



Simple Depth Gauge.

Easing Snake Through Long Conduit Runs.

The sticking of a snake in a long run of conduit is often a troublesome matter, as it requires hard work to get a long snake through numerous bends and couplings. To remedy this take a rag soaked in kerosene oil and pass the snake through it as it is fed into the conduit. This makes the snake slide in easily and as much as 200 feet of snake can be pushed through as easily as 50 feet without using kerosene as a lubricant.

James McCartin.

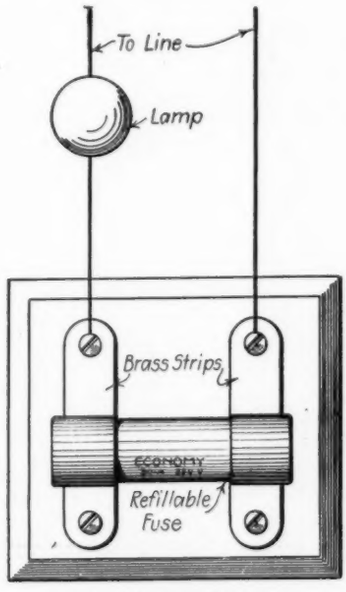
Wire Scraper.

I find that when running bell wires, electricians find much trouble from scraping the wires by means of a sharp knife in order to remove insulation. Very commonly this cuts the wire almost entirely in two and in nearly all cases greatly reduces the effective cross-section. To avoid this, I have made a wire scraper from a piece of an old hack-saw blade, using the back of this to scrape the insulation. This works very satisfactorily and does not damage the wire in any way.

W. Morris.

Simple Device for Testing Fuses.

A very simple device for testing refillable cartridge fuses is shown herewith. A lamp is connected in series with the line and the two line wires are brought down



Fuse-Testing Device.

to a block of wood to which two strips of brass are fastened. The fuse is merely placed across these two strips. If the lamp lights, the fuse is still good, but if it does not the fuse must be properly refilled.

M. Schwam.

Cleaning Stranded Wire.

Probably all who have had to clean stranded wire in preparing for a splice or tap, find it very difficult to clean out the insulation between the wire strands. If one will take a file card such as is used in cleaning out the particles of metal which choke up a file, it will be found to do the work quickly and easily. In fact I believe it will be a very agreeable surprise to any wireman who has never tried it. These file cards may be purchased for a small sum at any good hardware or machine shop.

Arthur S. Nickerson.

THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

REVIVING BANKRUPT AND OUTLAWED ACCOUNTS.

Suggestions for the Electrical Dealer to Aid in Reducing Losses from Bad Accounts.

By W. B. Parker.

Accounts against men who have gone through bankruptcy, as well as those that have been allowed to outlaw, are usually considered absolutely worthless. Therefore any plan that holds out a promise of reviving even a small percentage of this class of accounts is of decided interest to those who are unfortunate enough to have any on their books. It is true that in the case of bankruptcy there is practically nothing that can be done at the time to secure any better adjustment than will be secured without effort should the assets prove sufficient to allow of any dividends for the creditors at all. The forwarding of the claim to an attorney will usually avail nothing except that there will be an extra and entirely unnecessary collection fee to pay out of whatever dividends may be declared.

But the experience of a large electrical jobbing house proves that it is possible to collect a reasonable percentage of this class of accounts after the lapse of sufficient time. While such an account is not recoverable in a court of law, no matter how much the former debtor may be worth, there is no law against asking him to pay it, and if the method of asking is properly diplomatic some results are sure to be obtained. In the particular case mentioned it so happened that one of these former bankrupts was again on his feet financially and was possessed of the kind of conscience that demanded the payment of all his former indebtedness regardless of the lack of legal liability. So he wrote to this house, inclosing a draft for the amount of his old bill as well as interest to date. This led to renewed interest in the subject of the so-called dead accounts, many of which had been long since charged off to profit and loss, and they were again looked up and listed. Then a letter was prepared, somewhat as follows:

Mr. Bankrupt Debtor,
Chicago, Ill.

Dear Mr. Debtor:—

This morning we were very much surprised and gratified to receive a draft from an old customer of ours, who, like yourself, was compelled to take advantage of bankruptcy proceedings through no fault of his own. The draft covered the full amount of his old account and interest to date.

This led us to believe that there were probably others who felt equally as kindly disposed to us, and in this connection your name occurred to us as that of an old and valued customer with whom our relations had always been most pleasant.

We trust you are again meeting with the success you certainly deserve and would be very glad to hear from you and renew our former pleasant acquaintance. If we can be of service to you at any time, just let us know.

The writer will look forward to hearing from you soon, even if only a few lines, and is enclosing stamped return envelope for your convenience.

Yours very truly,
A. DIPLOMAT,
President, Jobber & Company.

This letter, with such alterations in wording as was necessary to make it fit outlawed as well as bankrupt accounts, was sent out to the entire list. While many did not answer, yet a number did and made some arrangements to take care of the old account by installment payments. Those who did not answer received several follow-up letters, or rather notes, merely referring to the previous letter and asking the favor of an answer. The following will indicate the style of follow-up used:

Mr. Bankrupt Debtor,
Chicago, Ill.

Dear Mr. Debtor:—

Our president is very anxious to receive at least a line or two in answer to the note he personally dictated to you some days since. He wants to say that he fully understands you are probably quite busy just now, but that he will consider it a personal favor if you will spare a couple of minutes to write him.

Assuring you of our desire to serve you in any possible way, we remain

Yours very truly,
JOBBER & COMPANY.

Four of these follow-up notes were sent before the account was given up for the time being. But such satisfactory results were obtained from the list as a whole that it is the intention to attempt a similar plan every year or two. It not only brought in the money that would not otherwise have been received, but the by-product of restored good will is considered to be of much value. Whether unconsciously or not, the average human being feels antagonistic to one he has long been indebted to and is inclined to do him an injury whenever the opportunity offers. It therefore follows that even where it is not desired to have any further business dealings with a debtor under any circumstances, yet it is very much worth while to have his good will on account of possible influence with others with whom the creditor does want to do business.

Redeemable Coin to Introduce New Branch Office to Electrical Consumers.

To make known its new branch office at Broadway and Eighty-ninth Street, New York, and interest consumers in the purchase of electric appliances, the United Electric Light & Power Company has issued a nickled coin, about the size of a half-dollar, for general distribution among its customers and others.

On the front side of the coin is the word "United," reading directly across the center in letters one-quarter inch high, and with staggered flash lines leading to the edge. Around the edge, in smaller letters, is the company name and location of general offices at 130 East Fifteenth Street.

The reverse side of the coin reads: "One only good for 50 cents on an appliance purchase at our United Electric Shops until October 1, 1916—Souvenir of the opening of Branch Office, Broadway at Eighty-ninth Street."

This coin with its two-fold purpose is bringing highly satisfactory results to the company. Many have been redeemed for the purchase of electric goods.

Selling 1500 Vacuum Cleaners in Six Weeks

Electric Shop of Kansas City Light & Power Company Demonstrates What Can Be Done by a Comprehensive Effort—Motion-Picture Films an Important Factor

The Kansas City Light & Power Company, of Kansas City, Mo., sold 1,500 vacuum cleaners in six weeks. And it wasn't an extraordinary effort, just a sort of a test of what might be done. The most extensive feature of the effort had to do with the advertising. The sales force made a record of 99.5 per cent of sales where demonstrations were given. There was no attempt to cover the entire city.

Twelve hundred electric carpet sweepers were sold in the period, and 300 vacuum cleaners. The former were regularly on sale previous to the campaign at $19.75; the sale price was $15. There was no reduction on the vacuum cleaners, which went at the usual price of $50 and $60. The company received no payment on delivery, and gave the customer six months in which to pay.

The advertising for the campaign was very carefully planned, and quite as carefully was the work of solicitors planned to get the maximum value from the advertising. The newly organized publicity department of the company had its first big chance in this campaign—and it "made good."

YOU CAN DO IT

By means of a carefully planned campaign 1,500 vacuum cleaners were sold in a period of six weeks by the Kansas City Company.

Two cleaners were featured and only on one was there a slight reduction from list price.

What this company has done can be accomplished by any live dealer without undue expense.

The advertising was of five kinds—display window, motion pictures, street-car cards, newspaper space and monthly bills.

The company had planned to make its drive on vacuum cleaners coincident with the usual spring clean-up in Kansas City, which is set for some time in April, and is preceded by several weeks of agitation by the city health department and various civic organizations. Ordinarily this city campaign makes its first appearance about March 1, and plans were therefore made to start the advertising at that time. On the February bills sent to customers, were printed advertising coupons bearing the offer of the cleaner at $15, and they went into the hands of customers on March 1. A few orders came in. The real campaign, however, began March 15. The bill-coupons have always been considered valuable advertising, for every customer has to see what they say, as he tears them from the bill, or glances at the statement to observe the charge.

On these coupons appeared for the first time the "slogan" of the campaign, "It Will Help Mother." And it was used on every bit of advertising, often being repeated one or more times, for emphasis.

The show window of the Electric Shop was used during the entire period for the display of sweepers and cleaners, the display being changed three times, and the window in two cases containing other devices also. The displays were arranged with the usual taste of the manager of the Shop. Cards, "It Will Help Mother," were placed by the cleaners.

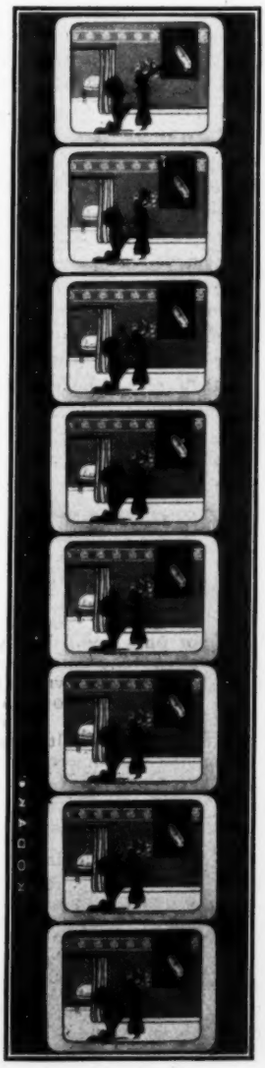
Advertising cards were placed in the street cars March 15, bearing the offer of the sweeper for $15. For two weeks previous, however, "teaser" ads had been run on these cards. The first ones bore only the words "It Will Help Mother." Then cards appeared with the added phrase, "It's a vacuum cleaner at $15." For six weeks, then, the cards bore the full advertisement, and a picture of the machine.

Newspapers were used only on Sundays, starting March 19. The three Kansas City newspapers had half-page advertisements on three Sundays. The largest response, in inquiries, came on Mondays following the appearance of the newspaper advertising and this factor shares with the motion pictures the credit for the larger Monday sales.

There had, however, been a preliminary notice of the approaching cleaner sale, in the newspapers of March 6. The company had used large space in hooking up its sales of household appliances with Baby Week, and a part of this space was employed to refer to the sale of vacuum cleaners.

Motion-Picture Advertising.

The most important publicity feature, however, was the advertising films. Five different films were prepared, two by one company making them in Kansas City, three by another. The scenarios were composed by representatives of the film companies, the publicity department of the light company, and men and women in the lighting sales department. One of the pictures showed a procession of animated brooms; the terrific dustcloud; a housewife throwing up her hands, exclaiming that she is tired of it and wants a vacuum cleaner; a vacuum cleaner enters, and cleans a room without dust. Another picture showed a man sweeping, the woman standing by holding a club over his head, saying "I've endured this drudgery long enough;" he hastily brings her a vacuum sweeper.



In each of the pictures, the slogan, "It Will Help Mother," was the closing feature of the display.

Twenty-five motion-picture houses were used. Five of these were down-town, the largest and best houses in the city. The five pictures were shown at these houses near the beginning of the campaign, and again at its close. The business-district shows are repeated 11 times a day.

—IT WILL HELP MOTHER—
If you buy her a Thor Electric Carpet Sweeper and Vacuum Cleaner combined.
There's no Dust left.
It's 98½ per cent efficient—
In a class by itself.
$15—ONLY—$15
NOTHING DOWN—6 MONTHS TO PAY
Free test in your home.
Call, phone or write.
ELECTRIC SHOP,
1500 Grand Ave.
Bell—Grand 60. Home—Main 60.
—IT WILL HELP MOTHER—

Advertisement on Monthly Bill.

In the suburban theaters, each house hand the films one week. Every Saturday evening the films were changed to other theaters, the week's display having given all the picture patrons of the particular communities an opportunity to see the films. The light company selected the theaters and planned the booking.

The large number of telephone inquiries received Monday mornings were directly traceable to the motion-picture advertising; most of them came from the districts where the advertising films had been seen for the first time on Saturday night or Sunday, in the community theaters.

Each of the five films was 30 to 50 feet. The cost was $3 per foot per week, including manufacture and exhibition.

A sales force of five men was assigned to the electric carpet sweeper and vacuum cleaner campaign, young men taken from the lighting sales department, but without special experience with the cleaners. They had, however, been given a short course in demonstrating the devices, and had been coached in sales talks. These young men made a house-to-house canvass, always in the communities where the advertising films were being shown. On Mondays the salesmen transferred their activities to the district to which the films had been transferred, adjusting their work as the campaign progressed. For instance, only two suburban theaters had the films the first week; all five worked in those two districts. The next week, three suburban theaters had the films, and three of the men went to those districts, while two remained in the first communities where the films had been shown. The salesmen did not carry cleaners with them; and this was considered an important point. They could not gain audience, much less entrance into the houses, with cleaners in their hands. They merely sought prospects, asking for the opportunity of demonstrating the cleaners. During the first few days of the campaign, the men made definite effort to work for a continuous period soliciting. But soon it became impossible—and unnecessary—to set aside any time for this detail. The requests for demonstrations were secured while going from one demonstration to another. Frequently enough such requests were obtained from neighbors during demonstrations, to fill the next day. The men were able to make about 10 demonstrations a day, and the estimated time spent in seeking prospects was an hour a day. The chief handicap in piling up sales was in the time lost between demonstrations. Each housewife was allowed to choose her own time for having the machine shown in action. The concentration of the solicitation kept the prospects localized, but frequently gave far longer periods for demonstrations than were necessary.

The average of prospects solicited who asked for demonstrations was nearly 30 per cent.

Telephone Requests for Demonstrattions.

The telephone calls into the office, asking for demonstrations, kept three women from the Electric Shop "on the jump." These calls were a difficult matter to handle, because they came from widely scattered districts of the city. Some were from districts five miles and more from the central office, and two or three miles from a motion-picture show, but in most cases the prospects had seen the films somewhere. Other calls were from the districts of the films, but many blocks from the sections being worked by the salesmen.

While the selling effort was concentrated on the cleaner at the bargain price of $15, nearly 25 per cent of the demonstrations resulted finally in the sale of a more expensive machine. The request for information on the higher-priced cleaners was always spontaneous—but was of course met promptly by the salesmen and salesladies.

The cases in which demonstrations, either of the bargain cleaners or the more expensive ones, did not result in sales, were negligible, excepting of course the return of a cheaper for a better machine.

TO GET
This Electric Vacuum Cleaner
For $15 at Special Sale
You Must Call the Kansas City Light & Power Co.'s NEW Telephone
BELL, GRAND 60 HOME, MAIN 60
This price will not long be maintained. Order NOW if you want one
Nothing Down
Six Months to Pay!
Free demonstration in your own home. No dust, no dirt, no torn up home if you use an
ELECTRIC VACUUM CLEANER
THE ELECTRIC SHOP
1500 Grand Avenue
NOTE THE NEW NUMBERS
Bell, Grand 60; Home, Main 60

Sample Newspaper Advertisement Used During Campaign.

CORRESPONDENCE AND DISCUSSION

A Reader's Page Wherein Opinions on Topics of General Interest May Be Expressed

Faulty Chicago Electrical Code Rule on Battery Testing.

To the Editor:

On page 111 of the 1916 Electrical Code of the City of Chicago there appears as Section *i* under Rule 38C, relating to garages, this clause: "No battery shall be tested except by means of a voltmeter." This clause does not say what the Electrical Department means, in my belief. It is my opinion that the electrical men of the city wished to make a rule to prevent the ignorant garage man from putting an ammeter across the terminals of a battery.

The rule should, however, be worded differently, because, as it stands, literal interpretation would prevent the use of a hydrometer in the operation of a battery. The hydrometer by no means should be excluded from the operation of batteries, nor should the impression be conveyed that a voltmeter is all sufficient to their proper operation (see Armour Engineering, May, 1909, article by Flanders, "The Hydrometer in the Operation of Storage Batteries"). This rule should be brought to the attention of all garage men as well as of the city's electrical inspectors.

H. E. Weightman.

Chicago.

Disposal of Refuse from Woodworking Establishments.

To the Editor:

With reference to the article on wood waste in your March 11 issue, study of the problem brought me to the definite conclusion that the time has not come when we can advance any general plans for the successful disposition of wood waste. Such mills and factories where wood waste can be utilized, are exceptions. I do not intend to advance the idea that wood waste is being profitably disposed of wherever possible. On the contrary, a careful study indicates conclusively that many factories could turn losses into profits, were they alive to the possible utilization of their wood waste.

H. S. Sackett, formerly in the employ of the Government Forest Service, with Forest Crissey, wrote an excellent article for the *Saturday Evening Post* on the "Utilization of Wood Waste," dwelling chiefly upon the mechanical phases of the problem. He cited many instances where waste had been converted to profit by bringing together the producer and consumer.

Much emphasis was placed on the importance and difficulty of bringing the supply and market together. Could this be done the situation would be vastly improved, but still far from being on a working basis. I thoroughly agree with Mr. Sackett's views, but it is my opinion that, having discovered and classified all of the users of wood waste, the production would still be vastly in excess of the amount disposed of.

The use of briquetting machines for the manufacture of compressed wood fuel, does not seem to have increased to any great extent. Sawdust used as a binder in the manufacture of composite board, flooring and similar material, has opened a big field, but for this purpose only a selected list of woods may be used. One reads of sawdust used in the manufacture of cattle food. It is the principal ingredient in a certain class of cleansers. But, notwithstanding, these and other avenues for disposal, the wastage is enormous.

In the South there are great possibilities for the utilization of slabs, and refuse from the lumber mills. Turpentine, resin, etc., are extracted in a destructive process and the residue, a cellulose fiber, is used for making a cheap kind of box-board paper. In some of the Northern States, distillation processes are used for the manufacture of alcohol, acetone, potash, charcoal, etc. There are also destructive processes where the wood is first macerated and then treated for the extraction of certain chemicals. No such process can be put to general use nor has it proved commercially practicable.

If we could place a central chemical plant to take the entire refuse output for a certain district, we would have a satisfactory solution of the wood-waste problem. Until we find it necessary to resort to measures of economy not hitherto foreseen, the development of these processes will of necessity be very slow. The natural resources of our country are still too plentiful to make it profitable or even desirable to conduct any research along these lines.

This fact should not be overlooked: The woodworking manufacturer is usually too busy to give much attention to the waste pile. The alert power solicitor can often find an outlet.

William S. Taussig,
General Electric Company.

Chicago, Ill.

The Evil of Thoughtlessness.

To the Editor:

I had an experience recently, which I thought might be of value to central-station companies in general.

A fire extinguisher salesman came in to demonstrate his extinguisher. About the first thing he tried to explain was how easily you could combat a fire between partitions, where electric wires started fires. I immediately put the question to the salesman, suppose the fire started from some cause other than electric wire between the partitions, what kind of an extinguisher would it be necessary to use then, and why do you refer to fires between partitions as originating from electric wires? His answer was that a central-station man in Pennsylvania told him how handy his extinguisher was for this purpose. I took the position that there may be many reasons for fires starting between partitions, and that I thought it was a mistake for anyone trying to sell his equipment to central stations, who are combating daily with the erroneous statements in newspapers and comments from Fire Departments, and the public in general, about fires being caused through electric wires, when in fact, they don't know the cause, to feature this point, and especially as coming from a central-station man.

This being such a concrete example of how much harm can be done innocently, I believe mention, through electrical journals to electrical men, of a specific case as this being made, may be of benefit to the industry.

E. A. Bechstein,
Manager, Sandusky Gas & Electric Company.

Sandusky, O.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 344.—Life of Gas-Filled Lamps at Various Voltages.—What is the rated life of 110-volt Mazda "C" lamps at rated voltage and at voltages two per cent above and below rated voltage? If available, kindly give data on the life at various voltages ranging both ways from 110 volts up to eight per cent.—R. D., Washington, D. C.

No. 350.—Power Supply for Traveling Crane.—In the case of traveling cranes where either direct current or alternating can be purchased, which kind of power supply would be better adapted for the purpose?—C. J. E., Toledo, O.

No. 351.—Annunciator Trouble.—I have some trouble with an automatic set-back annunciator system in a fine residence. It has a ground, but I do not want to take up any floors or tear into walls to find it. Could someone suggest a simple way to locate this ground and some way to overcome the trouble? There are steam pipes and gas pipes in the house.—R. L. G., Reynolds, N. C.

Answers.

No. 345.—Demagnetizing Iron Castings.—How can magnetized iron and steel castings be readily demagnetized? We are experiencing a great deal of trouble with castings that have been magnetized by the lifting magnet in the foundry yard. When these castings are being machined, it is impossible to get the true size, inside or outside diameter, because of the magnetic attraction on the calipers. Some of our work is large and some quite small. An alternating-current demagnetizing coil would have to be too large and costly to be practicable. Is there no cheaper or easier way to demagnetize these castings?—J. B. K., Torrance, Cal.

The specific request in this question is for some way of demagnetizing castings so that they would not affect the calipers or other measuring instruments. The answers already published of course dealt with the problem of demagnetizing, but it has occurred to the writer that the cheaper and more practical solution of this trouble is to use calipers made of some nonmagnetic material, such as brass or bronze. Certainly, if elimination of measuring difficulties is the only reason for demagnetization, it can be secured most readily in the way suggested.—J. M. P., Salt Lake City, Utah.

No. 346.—Electric Arc for Cutting Scrap Metal.—What voltage should be used in cutting up old boilers with an electric arc? Of what material and shape should the electrode be? What safety device is most practical for preventing overloading transformers used in such work?—L. G. C., Lincoln, Neb.

The voltage employed will depend upon whether the electrode is of carbon or metal. For a carbon or graphite electrode the voltage will vary between 30 to 70 volts, and the current from 150 and 250 amperes. For a metallic electrode the voltage will be between 20 and 30 volts and the current from 50 to 150 amperes. The carbon electrode will have a diameter of 0.25 to 1.5 inches, according to the class of work, and the rate at which it is desired to do the cutting, that is, the current employed. The carbon or graphite electrode is used for cutting, because it is superior to the metallic electrode as regards speed of cutting and cost of operation, and is far more stable and hotter. In cutting, the arc should be kept short, so that the heat will be concentrated where required. Welding or cutting is accomplished by means of a heavy current at a low voltage. If this current is obtained from the ordinary supply circuit the excess voltage must be consumed by the insertion of resistance—an inefficient method—since the major portion of the total energy is dissipated in this rheostat. To overcome this it is customary to use motor-generator sets consisting of a motor designed for commercial supply voltages driving a low-voltage direct-current generator. These sets may be stationary or may be made portable for carriage from job to job, for example, about the foundry or railway shop. The large electrical manufacturing companies make these sets. Before connecting them to the power supply, fuses or circuit-breakers should be installed to prevent damage to the set should abnormalities develop in the line. The motor-generator sets are either specially designed to protect themselves against short-circuit, or else relays are installed to accomplish the same purpose. One form of motor-generator set is equipped with a relay that cuts resistance in between the terminals of the generator and the arc, if the electrodes are placed in direct contact for more than a definite length of time. As soon as the current is interrupted the relay cuts the resistance out of circuit. Another type of outfit utilizes a compound-wound direct-current generator with the series and shunt field windings wound differentially with regard to each other, and when the current approaches short-circuit the voltage drops to such a value that the current does not exceed a safe amount. Such a generator is a variable-voltage machine, that might almost be called a constant-heat machine, since it gives a constant current, and supplies exactly the voltage required at the arc. The welding outfit should be designed or adjusted to care for short-circuits at the arc, and the main fuses or circuit-breakers ought to operate only as a last resort in case of accident at places other than the arc. Otherwise there are liable to be numerous shutdowns at inconvenient times, increasing the cost of performing the work. For heavy work, the electric arc is often most economical; it is the only solution for cutting metal above about seven inches in thickness. For light and thin work, the oxy-acetylene flame will often be found to be more economical than the electric arc. In many cases the use of electricity where oxy-acetylene was indicated has resulted in the arc coming into bad repute. Speaking generally, the gas flame is indicated for light work, and for heavy work the electric arc. With the oxy-acetylene flame the metal is heated to incandescence and pure oxygen is then turned on and the metal burns away. With electricity the metal is melted off. If there is very much cutting to be done, the lower operating costs might favor the use of electricity, but where the apparatus will be called into use but seldom oxy-acetylene cutting will be found more economical in all probability because of the lower initial cost, etc.—K. R., Chicago, Ill.

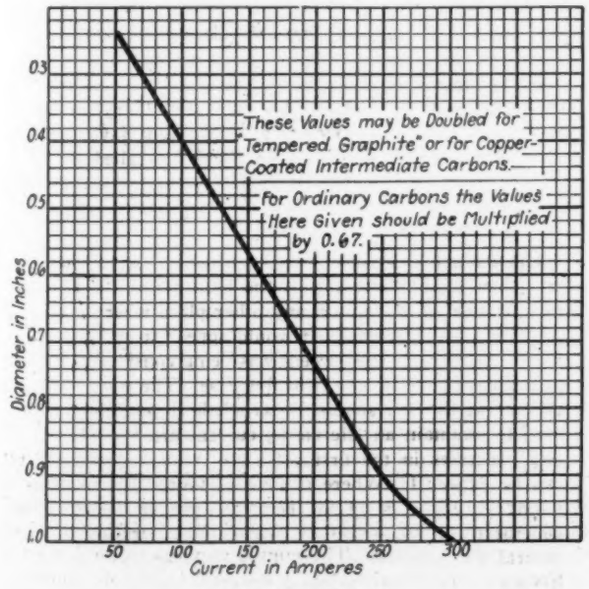
The carbon arc, since it generates heat energy at a higher rate than the metallic arc, is the best adapted for cutting of iron or steel or for use in any other place where a large mass of metal is to be heated. It would appear from the question as asked, that alternating current was being considered as a source of power for the arc itself in this case. The use of alternating current at the arc should be avoided, if possible. It is very hard to maintain an alternating-current arc in welding or cutting processes in the first place and nothing but poor results can be expected. Where the initial source of power is alternating curent it is by far better to use an induction motor-generator set built especially for welding purposes. There are several very efficient welding or cutting sets on the market, all having the necessary safety devices for protection against overloads which occur quite frequently during these operations. These sets can be obtained in sizes suitable for a great variety of work even when the amount of welding or cutting is small. The current furnished the arc by these sets is direct and the average voltage generated is about 75 volts. This allows the operator to maintain a steady voltage at the arc ranging from 35 to 60 volts, depending upon the length of the arc, and to obtain current values up to 1,000 amperes, depending on the type and size of the machine. Although 300 amperes is generally considered sufficient for welding purposes, probably more sat-

isfactory results can be obtained in heavy cutting work if the current is kept a little higher, say, 400 to 700 amperes. This means an arc length of approximately one-half inch and an arc voltage of about 40.

Several shapes and sizes of welding carbons are made. Cylindrical electrodes with short tapered ends are the ones most commonly used in welding and cutting work. Long tapered electrodes are used for work of a special nature. The cylindrical electrodes may be obtained in sizes varying from 0.25 to 1.5 inches in diameter and in lengths varying from 6 to 24 inches, the 10 and 12-inch lengths being the most common. There are several grades of electrodes available, namely the ordinary welding carbons, the intermediate grade for severer conditions, the copper-coated intermediate carbon design for higher current-carrying capacities than the uncoated intermediate, and the "tempered-graphite" grade or the high-ampere welding quality. In general, the carbons should be hard and solid and in burning away should leave a round end instead of a pencil point.

The accompanying curve shows the carrying capacity in amperes for the different sizes of carbons mentioned above. This curve is for the intermediate grade of carbons; for the common grade multiply the values by the factor 0.67 and for the copper-coated intermediate and tempered-graphite grades the values read from the curve should be multiplied by 2. Either the one-inch-diameter copper-coated intermediate carbon or the one-inch-diameter tempered-graphite carbon would probably be suitable for cutting work in the case at hand. Oftentimes where a narrower cut is desired, such as in cutting beams and rods, a 0.25-inch-diameter tempered-graphite electrode can be used to very good advantage.

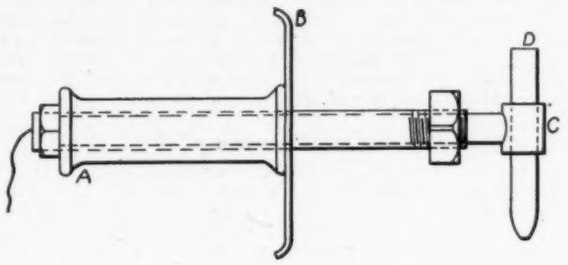
A special holder for welding carbons is shown in Fig. 2. The lead wire is brought to a clamp at the end of the holder through an insulated handle protected by a guard. Some of the electrode holders furnished with the welding sets have a unique push-button control for opening and closing the circuit. In drawing the arc it is simply necessary to touch the carbon



No. 346.—Fig. 1.

to the metal to be cut and withdraw it instantly to a distance of about one or two inches; the arc distance can then be regulated by moving the carbon point nearer or farther from the work, depending upon the heat desired. The short arc is the hottest and also consumes the greatest current. The carbons are generally clamped in the holders about four to six inches from the arc end in order to keep the resistance of the circuit as low as possible.

The following precautions should be taken. Never expose any parts of the body to the arc. Always wear a helmet fitted with a mask and some form of colored glass (a combination of ruby and green glass is good) through which the process can be observed without injury to the eyes. Heavy gloves should be worn to protect the hands from the arc and flying sparks, and a heavy apron to protect the clothing.



No. 346.—Fig. 2.

The metal to be cut should always be connected to the positive side of the line, as about three-quarters of the heat is liberated at the positive end of the arc. It is also very difficult to maintain an arc of appreciable length when the metal is made the negative side, probably because the metal does not become as hot and consequently there is not so much vapor formed to support the arc.

In cutting, provision should be made to allow the molten metal to flow away from the work. If the arc can be worked horizontally underneath the metal this will allow the molten metal to flow out of its own accord. In starting to cut, hold the arc stationary until a hole is melted in one place, then draw the arc along gradually in the direction it is desired to cut the metal.—A. B., Cleveland, O.

No. 347.—Wiring for Polyphase Motors.—(1) There are to be 15 to 20 five-horsepower motors (each 440 volts, three phase) in a manufacturing department supplied from one feeder in conduit. All of these motors are in a space 35 by 24 feet. It is difficult to find space to locate fuse cabinets directly at the point where the branch circuit for each motor is tapped onto the feeder. Would the Code permit locating the motor fuses near to the motors and the use of one or two steel cabinets for terminal boxes where all the branch circuits may be tapped onto the feeder? (2) Where several large motors from 20 to 75 horsepower are supplied from one feeder, can the starting fuses be located near the motor instead of where the branch circuit taps on?—R. B., Jackson, Mich.

(1) According to Rule 23*b* of the National Electrical Code, fuses must be placed at every point where change is made in the size of wire (unless the cutout in the larger wire will protect the smaller). It is therefore evident that, unless special permission is obtained from the inspection department having jurisdiction, the scheme of one or two terminal boxes would not be approved. One way would be to feed the motor branch circuits from two distribution cabinets containing the proper fuses for each motor circuit. Conduit could be installed from these cabinets directly to starting devices of the motors. By properly locating two centers of distribution the branch wiring would be reduced to a minimum and, as the size of the room is small, Rule 8*c* would be complied with. The writer has worked on one large installation where the feeders were run exposed and branch wires were tapped directly onto the feeders and fused only near the starting devices of the motors; motors were located an average distance of 30 feet from the feeder. But as this particular installation did not come under the jurisdiction of any inspection authorities, it is doubtful whether it would be approved elsewhere.

(2) Starting fuses could be mounted near the motor, providing they were installed in an approved manner, but that would require two sets of fuses instead of one, as the change of size of wire at the feeder would require a fuse also. (Rule 23*b*).—J. H. L., North Cambridge, Mass.

BOOK REVIEWS

"The Telephone and Telephone Exchanges." By J. E. Kingsbury. London: Longmans, Green & Company. Cloth, 538 pages (5¾x8¾ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for $4.00.

While not claiming to be a comprehensive history of the subject, this volume traces the development of the telephone and accessories from the early beginning down to the modern exchange system. The author shows great familiarity with his subject, outside of automatic telephony, which receives scant consideration. He has evidently given much study to historical research, and has presented his material in very readable style. His sources of information have been wide, as is illustrated by the fact that he has had access to the unpublished reports of conferences of experts of the Western Electric Company, to whom so much of the development of telephone engineering is due. There is a chapter on long-distance telephony, which recites the various steps leading up to transcontinental telephony in 1915, and the Pupin loading coil is described, but curiously enough no mention is made of other methods of loading, and only the briefest reference to the modern forms of repeaters. An inadequate chapter of 17 pages is devoted to "Instruments." Interesting chapters are added on "The Economics of the Telephone" and "The Telephone and Governments." An appendix gives interesting statistics of the subject.

The entire treatment of the subject is from the Bell standpoint, and except for work in England, developments outside of the Bell organization receive little attention. The names of such European workers as Gati are entirely missing, and the various forms of transmitter design originating in Europe are not mentioned. As a history of the Bell system, however, the volume is one of great interest and value, and brings together a mass of information which has not heretofore been collected in this form. It constitutes a valuable contribution to the literature of the subject.

"Automatic Telephony." By Arthur Bessey Smith and Wilson Lee Campbell. New York: McGraw-Hill Book Company, Incorporated. Cloth, 407 pages (5¾x9 inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc. for $4.00.

Until the appearance of this volume there has been no comprehensive treatise covering the subject of automatic telephone apparatus. The authors of this volume have considered all phases of the subject and the book should fill a real need among students of this subject. The connection of the authors of the Automatic Electric Company has naturally resulted in giving greatest attention to the apparatus manufactured by it, but considerable space is given to the description of other systems and methods, including a chapter on the system of the Western Electric Company. The subject is not treated historically, but present practice is described in relation to each of the American and foreign systems in actual use. One chapter is devoted to long-distance, suburban and rural line equipment. The final chapter is devoted to development studies. The rapid extension of the use of automatic telephone apparatus, especially in foreign countries, has created a world-wide interest in the automatic system, and the descriptions of both instruments and central-station apparatus here given will meet the requirement of a large group of readers.

"Wireless Telegraphy and Telephony: A Handbook of Formulæ, Data and Information." By W. H. Eccles. London: "The Electrician" Printing and Publishing Company, Limited. Three-quarters leather, 418 pages (4¾x8¼ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for $4.50.

The rapid growth of wireless telegraphy and its introduction in all parts of the world has created a need for all of the practical information which can be made available upon this subject. Many of the researches and results of investigations in this line have appeared in the transactions of engineering societies or in the technical journals and there is considerable need of a volume like this which presents a classified collection of information, data, formulæ and tables. The subject matter is presented in rather condensed form, with extensive use of mathematical formulæ and diagrams. Explanatory matter has been introduced where the author considered it necessary, but the treatment is usually made as concise as it can be made without omitting essential matter. The volume will be extremely useful to engineers and others engaged in the work of radiotelegraphy, especially as some of the material is now published for the first time. The book is divided into three sections dealing respectively with tables, formulæ and general information. Under the latter heading are included antennas, power equipment, transmitting and detecting apparatus, the design of high-frequency circuits, and descriptions of the principal systems of wireless telegraphy. A glossary of terms is given at the end. The principles and methods of wireless telephony are described in a chapter of 18 pages, which takes up the different systems which have been proposed and discusses their requirements. The 1915 experiments between Washington and San Francisco are mentioned, but no details given. The omission of the date of publication is a fault which is to be attributed, no doubt, to the publishers rather than to the author, who has done his work well.

"Practical Electric Wiring." By John M. Sharp. New York: D. Appleton & Company. Cloth, 256 pages (4½x6¾ inches), 151 illustrations. Supplied by Electrical Review Publishing Company, Inc. for $1.00.

This excellent little book gives practical instructions for carrying out the simpler kinds of electrical installation work. The author is an instructor in the Bliss Electrical School, and shows his familiarity with presenting the subject to students. The different methods of installing wiring are described in detail and illustrated. Armored cable does not seem to be given as much attention as it deserves. There is a chapter on wiring for motors, one on wiring for bells and annunciators and a third on wiring for telephones. A desirable feature of the book is the addition at the end of most of the chapters of a series of questions, which serve to test the reader's understanding of the subject. An appendix gives useful tables of various kinds. While this book does not take up all of the special problems which would be met by the experienced journeyman, it gives a very good introduction to the subject of wiring for the beginner in this work.

"Electrical Measurements in Direct and Alternating Current." By W. H. Timbie. New York: John Wiley & Sons, Incorporated. Paper, 8x10½ inches, illustrated. Supplied by Electrical Review Publishing Company, Inc. for $0.85.

These papers constitute a loose-leaf laboratory manual, comprising 39 exercises in direct currents and 11 exercises in alternating currents, with others in preparation. A sheet of general instructions for laboratory work is included. The exercises are numbered in groups, and each is complete on one sheet, there being no numbering of pages. The subjects appear to be chosen for their practical significance and value, and many of the stock experiments of the physical laboratory are omitted. The course appears to be designed for students in vocational and industrial schools, such as the Wentworth Institute, of Boston, with which the author is connected. The experiments are not all quantitative, as the title might imply, but include the plotting of magnetic fields, etc. The experiments are well chosen to cover, in a minimum of time, a considerable range of practical applications of electricity. The flexibility of the arrangement of loose leaves will commend this course to instructors wishing to make their own selection of experiments from those given, and with this idea in view, it is to be hoped that subsequent sheets will cover a large range of topics in this field.

NEW APPLIANCES

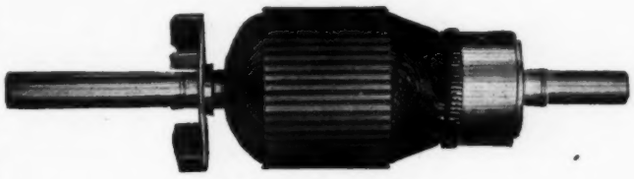
A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

New Direct-Current Motors of the Smaller Sizes.

To meet the increasing demand for direct-current motors of the smaller horsepowers for direct connection and drive of all kinds of industrial machinery, machine tools and the many motor applications requiring a low-power compact motor, the C & C Electric & Manufacturing Company, Garwood, N. J., has developed a new line of motors specially designed for this class of work.

These new motors, known as the type IB, are of bipolar type with interpoles and can be furnished in ratings up to 10 horsepower, either shunt or compound wound. For a general manufacturer's drives, as machine tools and other industrial machinery, the characteristics of the shunt-wound motor are the most desirable. It is essentially a constant-speed machine having close speed regulation from no load to full load, and is recommended for all purposes where the torque required for starting and accelerating does not greatly exceed full-load torque. The compound-wound motor is desirable for drives where the starting torque is much heavier than the full-load torque. This motor starts at a much heavier load than the shunt-wound motor and any degree of compounding can be furnished to meet conditions. Adjustment of the speed is obtained in both cases by either armature or field control.

The materials entering into the manufacture of these motors are the best obtainable to permit the closest limits of design, giving a compact machine, sturdy both electrically and mechanically. The main frame is cast integral with supporting feet and the pole pieces are separate. The main pole pieces and pole shoes are laminated and the interpole pieces are separately cast. The coils are all form-wound. The pulley-side bearing bracket is provided with a wide apron to protect the winding from mechanical injury and the bearing is supported by four arms with large openings between them, which makes a rigid open bracket, permitting free and ample ventilation. The commutator-side bearing bracket has four arms, giving a rigid bracket and free access to the commutator and brushes. Both brackets fit in a recess in the main frame, insuring perfect and rigid alinement.



Armature for the Motor.

The armatures are of standard design with laminated core. An air-agitating fan is placed on the pulley side of the shaft, next to the armature winding, to furnish the very high degree of ventilation and cooling necessary in motors of the smaller compact frame and guarantees severe service and heavy overloads. The addition of interior commutating poles completes the perfection and the excellent characteristics of these motors. They are the latest addition to the well known old standard C & C motors and it is said that they uphold the long-established reputation of sturdiness and perfect reliability of the old line. In continuous operation for long periods, they run cool and without attention. The interpoles insure sparkless commutation through the full range of load without changing the brush position.

The new line of motors is furnished in the open type, or with perforated or totally inclosing covers for protection against dust, metal chips, dampness, etc. For belt drive the motors can be furnished with either a universal slide-rail base or a belt-tightener idler pulley.

C & C Type IB Motor with Universal Base.

Main Frame with Field and Commutating Poles.

Solenoid-Operated and Motor-Operated Switches for Controller Work.

Electrically operated switches for use on control apparatus present an entirely different problem than do similar switches used in central stations and for switchboard work. In the case of the latter switches, operation is not very frequent and therefore the parts are not greatly subjected to wear. In such a case it is therefore possible to use relatively complicated driving mechanism with many parts without decreasing the efficiency of the apparatus. On the other hand, switches used for motor-controller work have to operate very frequently, in some cases as often as once every second, and the wear of the parts during operation becomes very important. The number of the parts of these switches has to be reduced therefore to a minimum and in order to reduce the wear the parts have to be made relatively heavy. This increases the inertia of the moving members and has a tendency to reduce the speed of operation. Speed of operation is of greatest importance, however, where heavy currents are to be handled. The increased inertia of the parts is therefore another reason for the reduction in the number thereof.

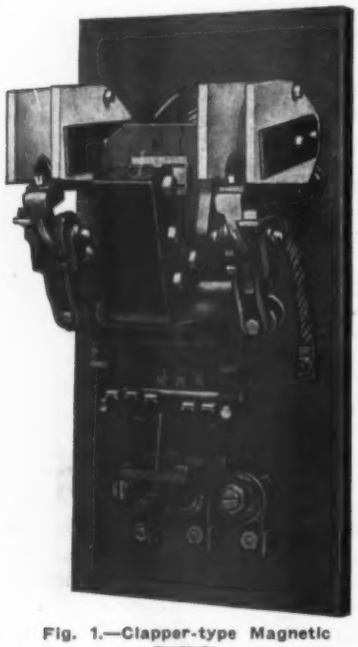


Fig. 1.—Clapper-type Magnetic Switch.

Direct-current switches for low voltages have been successfully built with solenoid operation up to the very large capacity of 10,000 amperes. The energy required by direct-current solenoids is relatively small and in the case of the 10,000-ampere switch, above mentioned, the total watt consumption was only approximately 100. There is practically no limit to the size in which direct-current magnets can be built in a substantial manner and of a sufficient speed for operation of switches of large capacity. However, when we come to the operation of such switches from alternating-current sources of supply, we meet a new problem.

In direct-current magnets the only energy which has to be taken care of is that consumed by the coil of the magnet. In alternating-current magnets, on the other hand, there is not only the current consumption of the coil proper, but also the energy lost in the shape of hysteresis and eddy-current losses in the iron to be taken care of. These losses are of much greater magnitude than the losses in the coil and, in order to keep them within reasonable limits, the iron structure of the magnet has to be laminated. This naturally weakens the magnet structure where very large powers are required. Since the larger the magnet, the smaller is the radiating surface through which the heat due to the losses can be dissipated, therefore there soon is reached a practical limit beyond which alternating-current magnets cannot be built to operate successfully for very severe service. Such magnets also have a tendency to be noisy, due to the pulsating pull of the magnet and the relatively very heavy armature which has to be employed to maintain a certain amount of pull. A relatively high current is taken when in its open position. Although this current is reduced automatically quite materially when the magnet seals, the apparatus employed for controlling the current in the magnet coil has to take care of the very heavy inrush current and is therefore subjected to very great wear.

For all these reasons, large switches for handling alternating currents have not been built with alternating-current magnet operation. Alternating currents of large power and high voltage are most effectively handled under oil and these switches are therefore mostly of the oil-immersed type.

For small currents and low voltages, which can be handled in oil satisfactorily, air-tight switches of the clapper type have been developed and have been in successful use for several years. Fig. 1 shows one of these switches. Small oil-immersed switches for voltages up to 2,200 and relatively low currents may also be handled by alternating-current magnets, such as are shown in Fig. 2.

For large switches, however, the alternating-current solenoid was not found suitable, due to the disadvantages enumerated above, and it was therefore necessary to operate such switches with a direct-current magnet taking power from a direct-current source of supply. Such a switch is shown in Fig. 3, having a capacity of 500 amperes at 6,600 volts.

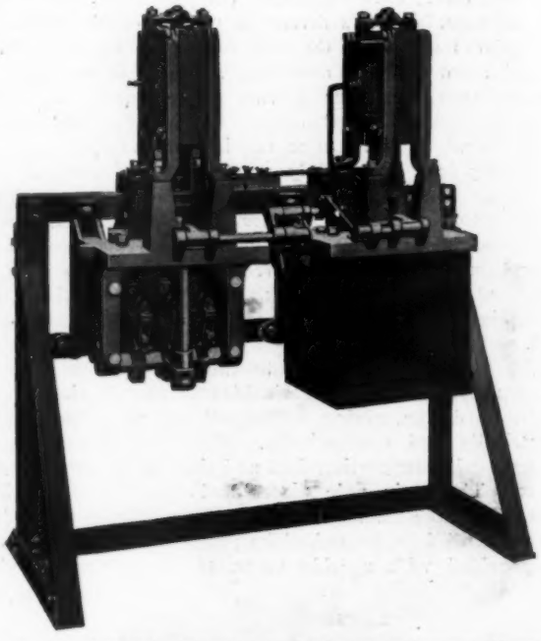


Fig. 2.—Oil Switches Operated by Alternating-Current Magnets.

In many installations where such alternating-current switches are to be employed for controller work no direct-current source of supply is available and it is therefore necessary in all such cases to install a motor-generator set, which is expensive and adds another link to the installation liable to break down. The motor-generator set also requires some attendance, which adds to the operating cost of the installation. The motor-generator set, or even an independent direct-current source of supply, makes the installation somewhat less reliable because the alternating-current circuit controlled from the switch can not be operated if the direct current should fail. For these reasons it seems desirable that the alternating-current switch of large capacity should be operated directly or through a stationary transformer from the alternating-current source of supply. This is made possible by the use of motor-operated switches recently developed by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

The principle of the motor-operated switch is to connect the motor armature by means of a lever and crank to the operating mechanism of the switch and to have the motor energized during the entire time during which the switch is to be closed, so that the switch operates on "no voltage." Formerly switches with motor operation were developed where the motor circuit was cut out after the switch was closed and a separate tripping mechanism was installed. Such switches, while admirably adapted for central-station work, are not suitable for controller work on account of the great complication which brings with it all the disadvantages enumerated above. Such switches would also be entirely too sluggish in operation for rapid controller work.

To operate the switch directly from the motor armature by means of a crank would require a motor of very large proportions, due to the large torque required. Furthermore, such a motor would consume considerable energy, and in view of the fact that the motor armature stands still during the entire time during which the switch is

Fig. 3.—Large Alternating-Current Switch Operated by Direct-Current Magnets.

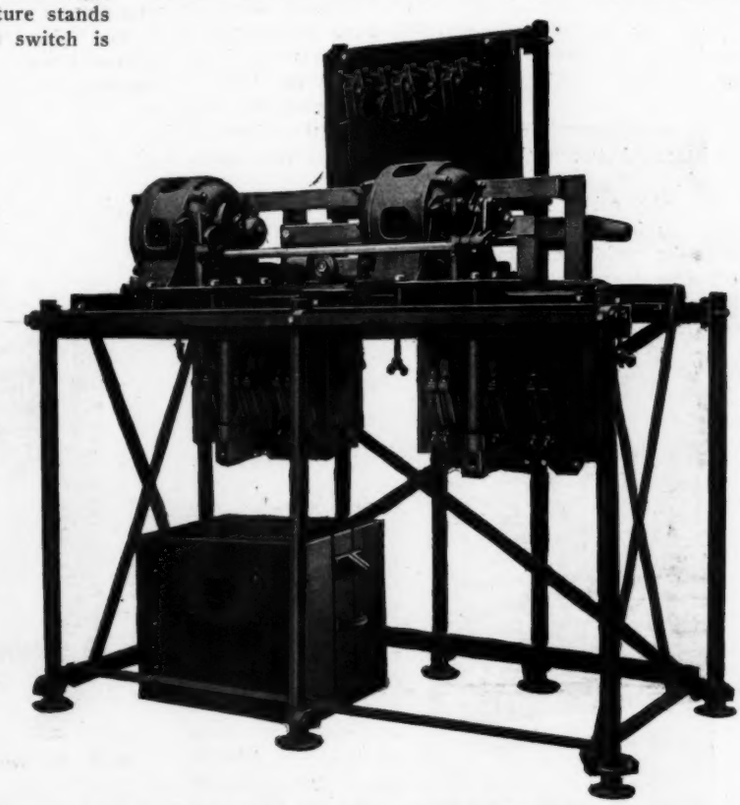


Fig. 4.—Motor-Operated Alternating-Current Oil Switch Group.

closed, with the exception of the short interval required for closing, it would be difficult for the motor to dissipate the energy which is developed therein. The simplest type of motor, however, can be used for such an installation, namely, a squirrel-cage motor, which requires nothing but a line connection.

In order to reduce the size of the motor, it is of course possible to gear the armature to the operating mechanism in such a manner that the armature makes several revolutions for the closing of the switch. This reduces greatly the size of the motor and obviates the difficulties stated above. There is, however, one difficulty to overcome. The armature after having made several revolutions attains quite a momentum and when the switch is closed it has to come to a sudden stop. With no provision against this there would be produced a considerable strain on the motor shaft and the gearing which would lead after a relatively short time to destruction of the apparatus. The inertia of the armature must be gradually absorbed outside of the positive stop on the switch without cutting off the power supply from the motor. Similarly, when the motor is cut off the line the armature revolves backwards and it is necessary for the operating mechanism to accelerate the entire armature. This consumes considerable time and when the switch reaches its open position the armature, if coupled tightly with the operating mechanism, produces another shock on the mechanism and gearing when stopped.

The new Cutler-Hammer switches obviate these troubles. The armature is connected with the operating mechanism by means of a pinion and gear sector but, instead of being keyed directly on the shaft of the motor, the pinion is connected with a slip clutch, which is set for a maximum torque slightly in excess to the torque developed by the motor at standstill. When the motor is first energized, the armature is accelerated and in moving it drives the operating mechanism through the slip clutch, closing the switch. When the switch parts reach their ultimate limit, the operating mechanism is stopped in a suitable manner, while the motor armature continues to revolve, causing slippage of the clutch, which absorbs gradually the inertia stored up in the armature, until the latter comes to a standstill and keeps the switch closed. When the circuit to the motor is opened, the switch members, which are under tension, accelerate the armature backwards and when the maximum opening of the switch is reached the switch members are stopped in a suitable manner and the armature is free to rotate through the slip clutch. The latter therefore prevents overstraining of the operating members of the switch.

The motor is designed so that it develops maximum torque at standstill, resulting therefore in the smallest possible motor for the work in question. The motor armature is built as light as possible, so as to reduce the inertia effect and permit of rapid acceleration in either direction so as to produce a rapid closure and opening of

the switch. The armature shaft is supported on ball bearings which require practically no lubrication or attention and all other parts are so rugged that they will stand up under service indefinitely. Particular attention is called to the slip clutch, which is built in a very substantial manner, having an asbestos-lining friction face.

Switches of the type described above may be built in any capacity and they have already been built for handling, in a three-pole type, currents of 1,000 amperes per phase, see Fig. 4. Two of such switches may be combined for reversing the primary of the motor circuit which is to be controlled and in this case they are mechanically interlocked in such a manner that one switch can only close after the other switch is fully opened.

The contact parts of these switches consist of copper-leaf brushes, which are protected by solid metal-block auxiliaries and the contacts are arranged so that they separate in a horizontal plane, producing a horizontal arc. This is easily extinguished by the oil, which being heated by the arc has a tendency to blow upwards or at right angles to the arc; thus the quickest possible elongation of the arc is obtained. The copper-leaf brushes have the advantage that each leaf forms a probable line contact, making it impossible for an oil film to produce a high resistance between the contact plate and the copper-leaf brush.

On the other hand, the heavy metal-block auxiliary contacts have a great cooling effect on the arc, causing it to be rapidly extinguished, and in order to prevent an oil film from producing a high resistance between the auxiliaries, which would cause sparking of the main brushes, the two contact blocks engaging with each other are slotted diagonally the slots on the two blocks crossing at right angles so as to permit the pressure exerted on the blocks to remove the oil film as rapidly and efficiently as possible.

The contacts are inclosed in an oil tank which is easily removable and which is supported from the cast-iron structure that also supports the motor and other operating gear. The leads are brought out through the top of the supporting case in a manner for affording easy wiring.

Noteworthy Church-Lighting Installation at Dedham, Mass.

A remarkable church-lighting installation has been completed in St. Mary's Church, Dedham, Mass., by Edwin C. Lewis., Inc., Boston. The fixtures consist of 14 prismatic glass chandeliers in the main church, and one similar fixture in the vestry. Each is made up of glass units connected by metal fastenings. The extreme length of each fixture is about 4.5 feet, and it terminates in a ball 3 feet in diameter. Within the ball is a 200-watt nitrogen-filled tungsten incandescent lamp, and around the circumference are ranged eight 25-watt tungsten candle lamps.

The fixture supporting the vestibule lamp is of handsome bronze and was imported from France. Around the altar are six large brackets supporting lamps similar to those in the nave, and the basement is lighted by Brascolites manufactured by the Luminous Unit Company, St. Louis, Mo.

View in Press Room of The Cook Pottery Company's Factory.

Practically all the porcelain used in the electrical industry requires great care in its manufacture to insure the electrical and mechanical properties required. Every detail in the process, from the selection and mixing of the raw materials to the shipment of the finished product, requires continual supervision and frequent close inspection. Following out such a policy has given The Cook Pottery Company, of Trenton, N. J., its reputation for turning out goods on a strict quality basis. It prides itself on producing porcelain of a clear white color and of extreme accuracy. The secret of this latter quality lies largely in the careful work done in the press room, a view of which is shown above; the photograph was taken just as the men were about to start their day's work. The company is now operating 69 presses with a daily output of 225,000 pieces of porcelain. There is being turned out at this factory dry-process work of every description and in sizes ranging from the very small, weighing 25 ounces to the 1,000 pieces, to the very large pieces, weighing over 6½ tons per 1,000. In the foreground can be seen an inspector gauging and closely examining a large piece of work that had been pressed up on the preceding day.

INDUSTRY ACTIVITIES

Palmer Electric & Manufacturing Company, announces the removal on June 15 of its main office and factory from 16 Franklin Street to its new location at 60 K Street, Boston, Mass. The company has obtained a large increase in floor space by the change.

Wirt Company, Germantown, Pa., manufacturers of Dim-a-lites and other electric appliances, announces that the Benjamin Electric Manufacturing Company, 590 Howard Street, San Francisco, Cal., is now acting as its sales representative on the Pacific Coast.

The Spencer Sign & Service Company has been organized at Stevens Point, Wis., by V. S. Prais and S. E. Swancutt, of that city. The company will manufacture electric signs made of punched metal, the openings to be star-shaped. The signs will be composed of changeable letters.

Roller-Smith Company, makers of electrical instruments and circuit-breakers, 233 Broadway, New York City, announces that the Electrical Material Company, 589 Howard Street, San Francisco, Cal., will handle its products in the state of Nevada and in parts of the neighboring states of California, Oregon and Idaho.

The Chain Belt Company, Milwaukee, Wis., has just distributed its folder No. 64 which gives complete data on its traveling water screens. The water screens are designed primarily to remove refuse and foreign material from water before it enters power plants, steel mills or any other industrial plant requiring large quantities of clean water.

The United Battery Corporation, New York, N. Y., announces that owing to its rapidly increasing business it has become necessary to move the general offices from the factory to larger quarters in the Woolworth Building. In addition to the space thus made available at the factory, the company has secured more space and is enlarging its manufacturing facilities.

The Century Electric Company, St. Louis, Mo., is distributing a new folder illustrating various applications of its small motors. Among the applications shown are a motor-driven ventilating fan, organ pump, garage compressor, dough mixer, sign flasher, etc. The company's line includes motors from 0.1 to 30 horsepower in size and its slogan is that standard motors are kept in stock at 33 points in the United States and Canada.

The Bureau of Electric Sign Engineering of Milwaukee, Wis., has filed articles of incorporation with a capital stock of $10,000 and proposes to furnish electric sign data to central stations, electrical contractors and electric sign men; also to manufacture parts of and complete electric signs and electrical advertising specialties. The officers are: J. B. Lindl, president; Joseph Lindl, vice-president; W. G. Garrett, secretary, and W. O. Meilhan, treasurer.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued an attractive booklet entitled "Something in It for You," in order to assist its agents and dealers in marketing the Westinghouse electric range. The booklet describes in a brief manner the advantages of this type of range together with a number of illustrations, and in addition outlines several methods of selling them, and gives some suggestions covering newspaper advertising, window trims, demonstrations, etc. The booklet is being distributed to central stations and dealers. The company has also issued catalog 1-A, entitled "Westinghouse Lightning Arresters," which covers the subject of lightning arresters and the various types designed for particular classes of service. A discussion of lightning and its effects is given, followed by discussion of the application of arresters for protection of various classes of apparatus. Following this is given a general description, accompanied by illustrations of the different types of lightning arresters and accessories manufactured by the company. Copies of the catalog will be sent to those making request.

Hart & Hegeman Manufacturing Company has moved its Chicago offices from the second floor of the Electrical Building, 619 West Jackson Boulevard, to the ground floor of the same building. The constantly increasing demand in the West for this company's product made the change necessary. In the new location the company obtains much better office facilities and unexcelled shipping facilities for "H. & H." and Paiste specialties, the Hart & Hegeman Manufacturing Company being sole selling agent for the H. T. Paiste Company. Haynes Everest, who is so widely and favorably known among the electrical fraternity, is in charge of the Chicago office of the company.

Electrical Publications Syndicate, Inc., New York, N. Y.—A syndicate house organ for central stations known as the *Electralogue,* in which each company maintains its individuality to such an extent that it may be said to be issuing its own house organ, is the product of the Electrical Publications Syndicate, Inc., of New York. The *Electralogue* aggregates, with cover, 40 pages. Twenty-four of these are devoted to syndicated reading matter consisting of articles gathered from every field of the electrical industry and presented in a popular and attractive style. The text is primarily sales stimulating, and presented with the human interest element emphasized. Bound in with these pages are four pages devoted exclusively to reading matter of the subscribing company. Here the central station can conduct its own selling campaigns as it sees fit, or it can tell in detail the news of the local field. Added to this, a separate cover and an inside cover page advertisement is reserved to the subscribing company, completing the individual features of the magazine. The remaining ten pages are devoted to advertising of a general electrical nature.

Canadian Electric Companies Merge.—A consolidation by which the Civic Investment & Industrial Company takes over the Montreal Light, Heat & Power Company has been ratified, thus effecting the organization of one of the most complete electric generating and distributing systems in the world. The Civic Investment & Industrial Company will have an authorized capital of $75,000,000. Of this amount, $65,300,000 will be issued presently to provide for the entire capitalization on the basis of exchange of Montreal Power and Cedar Rapids companies. The balance of the capital will remain in the treasury for future requirements. Under the agreement made the Civic Investment & Industrial Company will operate the Montreal Light, Heat & Power Company and the Cedar Rapids Manufacturing & Power Company, during the period of 98 years, and also guarantees all fixed charges, operating expenses, maintenance, etc., of both companies, and eight-per-cent annual dividends on the stock of the Montreal Light, Heat & Power Company and three-per-cent annual dividends on the stock of the Cedar Rapids Manufacturing & Power Company from August 1, 1916. It is understood that the new company will operate under the style and name of the Montreal Light, Heat & Power Company.

LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

AUTO-STARTERS.—Fairbanks-Morse Electrical Manufacturing Company, Indianapolis, Ind.

Oil-immersed switch and transformer mounted as a unit in metal case, with and without overload and no-voltage release coils. Used as a means whereby potential impressed upon alternating-current motor terminals may be made less than full line voltage during starting process. In off position transformer and motor windings are disconnected from line. Overload release is inoperative during process of starting motor, and other circuit-breakers or fuses are necessary in motor circuit. Capacity, 200 horsepower or less, 600 volts or less, type CC.

Note.—This manufacturer also furnishes auto-starters for circuits of voltage higher than 600 volts. These will be generally acceptable for use when installed in accordance with requirements of inspection departments having jurisdiction.

Listed April 26, 1916.

ELEVATOR-CONTROL APPLIANCE.—Warner Elevator Manufacturing Company, Cincinnati, O.

Elevator hatchway limit switch, consisting of double-pole series contacts inclosed in metal case with pivot-hinged cover, operated by contact of elevator shoe against cover. One switch installed at top of hatchway and one at bottom, both in main motor circuit. "Warner," 100 amperes, 250 volts.

Listed May 9, 1916.

FITTINGS FOR CONDUIT BOXES, Covers.—E. H. Freeman Electric Company, Trenton, N. J.

Porcelain covers for conduit boxes for use as rosettes. Catalog Nos. 350 and 355.

Listed May 16, 1916.

GROUND CLAMPS.—West End Machinery and Electric Company, 12 Minot Street, Boston, Mass.

Ground clamps for use with rigid conduit. "Wemeco." One-inch conduit or less.

Listed March 31, 1916.

HEATERS, Electric.—Eberbach & Son Company, Inc., Ann Arbor, Mich.

These electric drying ovens consist of a transite asbestos board case provided with a door, electric-heating elements, switches, a pilot lamp and a thermostat. A length of heater cord and a plug are provided on catalog No. 3031 for connection to supply circuit. No plug is provided with catalog No. 3032.

3.5 amperes, 110 volts; 1.75 amperes, 220 volts; alternating or direct current; catalog No. 3031.

9 amperes, 110 volts; 4.5 amperes, 220 volts; alternating or direct current; catalog No. 3032.

Listed April 22, 1916.

INCUBATORS, Electric.—Eberbach & Son Company, Inc., Ann Arbor, Mich.

These surgical incubators consist of a transite asbestos board case provided with a glass and a transite board door, a heating element, a pilot light and a thermostat. A portable cord and plug is provided for attachment to supply circuit.

1.5 amperes, 110 volts; 0.75 amperes, 220 volts; alternating or direct current; catalog No. 4287.

2.5 amperes, 110 volts; 1.25 amperes, 220 volts; alternating or direct current; catalog No. 4288.

4 amperes, 110 volts; 2 amperes, 220 volts; alternating or direct current; catalog No. 4289.

Listed March 16, 1916.

LIGHTNING RODS.—Hollow Cable Manufacturing Company, Hornell, N.Y.

Label service.

Listed April 12, 1916.

MINIATURE MOTION-PICTURE MACHINES.—The DeVry Corporation, 117 North Fifth Avenue, Chicago, Ill.

Portable motion-picture machines of miniature type consisting of asbestos-

Cover for Conduit Box.—E. H. Freeman Electric Company.

lined wood case enclosing projector mechanism, film, incandescent lamp and driving apparatus. Made in three types.

Hand-operated, 100-watt gas-filled lamp, 100-125 volts. "Commercial."

Motor-operated, 200-watt gas-filled lamp, automatic cutout for film breakage 250 watts, 100-125 volts. "Ever-ready."

Motor-operated, 200-watt gas-filled lamp, automatic cutout for film breakage, alarm clock cutout, 250 watts, 100-125 volts. "Automatic."

Standard only when used with slow-burning film supplied by this manufacturer.

Listed April 10, 1916.

RECEPTACLES, Weatherproof.—Pass & Seymour, Incorporated, Solvay, N. Y.

P. & S. 660 watts, 600 volts, conduit-box type, catalog Nos. 1176-77.

Listed April 12, 1916.

RECTIFIERS.—Chicago Rectifier Manufacturing Company, 6819 South Chicago Avenue, Chicago, Ill.

Mechanical rectifier and panelboard consisting of a synchronous motor driving a commutator which is designed to rectify alternating current at a reduced voltage obtained from an auto-transformer forming a part of equipment. Designed for moving-picture arc lamps. Four kilovolt-amperes, 110 volts, 60 cycles.

Standard when installed in a fireproof compartment separate from the moving-picture booth and in accordance with requirements of inspection departments having jurisdiction.

Listed April 29, 1916.

RHEOSTATS.—Fairbanks-Morse Electrical Manufacturing Company, Indianapolis, Ind.

Type CCR.

Listed April 26, 1916.

RHEOSTATS.—General Electric Company, Schenectady, N. Y.

Motor-starter panels, types CR-2213-16, 2321-26.

Listed May 16, 1916.

SIGNS, Electric.—Federal Electric Company, Lake and Desplaines Streets, Chicago, Ill.

Electric signs shown to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories have labels attached.

Listed April 3, 1916.

SIGNS, Electric.—Kirtland Electric Construction Company, 64 Hamilton Street, Albany, N. Y.

Listed April 15, 1916.

SOCKETS, Standard.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins metal shell. Key, 250 watts, 250 volts, catalog No. 7407. 660 watts, 250 volts, single-pole, quarter turn, catalog No. 4499.

Listed May 3, 1916.

SOCKETS, Standard.—Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

C-H, 660 watts, 250 volts, brass shell, push-button, catalog Nos. 7510, 7512, 7514, 7520, 7522, 7524, 7530, 7532, 7534; keyless, catalog Nos. 7521, 7523, 7525, 7531, 7533, 7535. Candle sockets, push-button, catalog Nos. 7516, 7518, 7526; keyless, catalog Nos. 7509, 7517, 7519, 7527.

Listed May 1, 1916.

SWITCHES, Pendant Snap.—Pass & Seymour, Incorporated, Solvay, N. Y.

P. & S. switches with pull-chain mechanism, 3 amperes, 125 volts; 1 ampere, 250 volts, catalog Nos. 3040, 3041.

Listed April 12, 1916.

PERSONAL AND BIOGRAPHICAL

MR. GEORGE H. GRAVES, former assistant electrical engineer of the Sanitary District of Chicago, has been appointed head of the department, following the resignation of Edward B. Ellicott.

MR. GEORGE N. ROOKER, manager of the Northern Idaho & Montana Power Company, at Sandpoint, Idaho, has resigned his position with the company, to take effect July 1.

MR. W. W. WHITE has been appointed superintendent of the municipal electric-lighting plant at Bolivar, Tenn., succeeding MR. F. M. SMITH, who has resigned.

MR A. B. ELIAS, general superintendent of the plant of the Southwestern Telegraph & Telephone Company, spoke at the meeting of the Dallas Electric Club—Jovian League on June 9 on the subject of "Safety First."

MR. J. ROBERTS WILSON, formerly sales manager and vice-president of the Crocker-Wheeler Company of Ampere, N. J., has become associated with the Davison Chemical Corporation of Baltimore, Md., as manager of the company's office at 120 Broadway, New York.

MR. W. P. NASER has been appointed by the Trumbull Electric Manufacturing Company, of Plainville, Conn., as manager of its branch office in Chicago, Ill., succeeeding MR. J. S. JACOBSON, who has resigned, as announced in the issue of June 10. Mr. Naser formerly was manager of the company's branch office in San Francisco, Cal.

MR. W. B. WHITEHORN, purchasing agent and assistant to the president of the Omaha Electric Light & Power Company of Omaha, Neb., has resigned to become secretary and manager of the National Oil & Paint Company. Mr. Whitehorn has been with the Omaha company about seventeen years. He will be succeeded as purchasing agent by B. P. Egan, formerly of Nebraska City.

MR. ROY HUSSELMAN, an electrical engineer representing F. W. Ballard of Cleveland, Ohio, has been retained by the board of water commissioners of Dunkirk, N. Y., to make a survey of the local electrical situation with the object of recommending whether or not it would be advisable for the city of Dunkirk to install new generating machinery in the municipal power plant or to buy power from the Niagara & Erie Power Company.

MR. PAUL F. GODLEY presented a paper on "Applications of the Audion," at a meeting of the Radio Club of America held recently at Columbia University, New York City, in which were discussed important considerations in design, construction and operation of apparatus used with the audion as a detector for short or long wave reception, as an amplifier, and as a generator of high-frequency oscillations to be used both in the reception of undamped waves, and as a source of power for radiotelegraphic and radiotelephonic transmission. Complete diagrams, data and specifications were given.

MR. A. L. MARTIN, formerly manager of the Dallas (Ore.) division of the Oregon Power Company, has been appointed superintendent of the Coos Bay (Marshfield) division of the company, succeeding MR. R. M. JENNINGS, who has resigned. MR. R. U. STEELQUIST, formerly manager of the Oregon Power Company at Corvallis, Ore., has been appointed superintendent of the Dallas division, succeeding MR. MARTIN. MR. F. M. HILDRETH, formerly superintendent at Junction City, Ore., has been appointed superintendent at Corvallis to succeed Mr. Steelquist, and MR. RALPH JAMES has been appointed superintendent at Junction City.

MR. G. D. EARLE, who was elected president of the Electrical Dealers and Contractors' Association of Ontario at the annual convention on June 6 to 8, as noted in our last issue, is a native of Peterboro, where he started into electrical work. For about ten years he was employed by the Canadian Pacific Railroad as a traveling electrical man. Five years ago he went to Toronto and for the past two years he has been carrying on a large contracting business, with offices at 72 Nelson Street. Mr. Earle organized the convention and for this work was elected president.

MR. D. S. MILLER, who has been appointed manager of power and lines for the properties of the Reading (Pa.) Transit & Light Company and affiliated companies, was formerly supervisor of power and lines of the electric properties controlled by the New York, New Haven & Hartford Railroad Company, embracing electric railways in Connecticut, Massachusetts, Rhode Island and part of New York State. Mr. Miller was with the New York, New Haven & Hartford Railroad Company about nine and one-half years. He was graduated from the Pennsylvania State College in 1900, and served with the General Electric Company for one year in its testing department and on outside construction work; with the Sprague Electric Company, New York, one and one-half years as erecting engineer, and with the Boston (Mass.) Elevated Railway Company about three years as assistant electrical and mechanical engineer.

OBITUARY.

MRS. JOSEPH ARNOLD, mother of MR. BION J. ARNOLD, consulting engineer, Chicago, Ill., died June 14. She is survived by one daughter and seven sons.

MR. EDWARD N. FOBES, president of the Fobes Supply Company, electrical supplies, Seattle, Wash., and Portland, Ore., was killed at Kent, Cal., June 5 in an automobile accident. Mr. Fobes was 52 years of age and had lived in Seattle 18 years.

MR. GEORGE GILMOUR, a trustee and member of the Executive Committee of the Museum of Safety and head of the inspection department of the Travelers' Insurance Company, died June 15, at his home, 107 Stratford Road, Brooklyn, N. Y., in his fifty-second year. He was an authority on accident prevention and industrial safety, and in 1910 was sent to investigate conditions in Great Britain, France, Holland, Belgium, Germany, Switzerland, and Sweden as a member of the Commission of the state of New York on Employers' Liability, Unemployment, and the Causes and Prevention of Industrial Accidents. His reports had much to do with the enactment of the present laws on those subjects.

DR. SILVANUS P. THOMPSON, noted electrical engineer and physicist and a former president of the Institution of Electrical Engineers, died in London, England, June 13. He was most widely known for his work in the development of dynamo-electric machines. Dr. Thompson was born in York, June 19, 1851, and was educated at the Botham School there, Royal School of Mines, Heidelberg, and other institutions. In 1875 he was graduated as Bachelor of Science from the University of London, and three years later took the degree of Doctor of Science, experimental physics being his special subject. In 1876, Dr. Thompson was appointed professor of experimental physics in the Bristol University College and continued in that capacity until 1895. Ten years before the latter date he was elected principal and professor of physics in the City and Guilds of London Technical College at Finsbury. He was made an LL. D. at Birmingham and an honorary M. D. at Koenigsburg. He was a Fellow of the Royal Society, of the Royal Astronomical Society, a member of the Royal Institution of Great Britain, the Royal Academy of Sciences of Stockholm, the American Philosophical Society, and senator and examiner of London University, in the organization of which he took a prominent part. Dr. Thompson was an honorary member of the American Institute of Electrical Engineers, a past president of the Junior Engineering Society, the Roentgen Society, the Physical Society, the Optical Society, the Southeastern Union of Scientific Societies, Section G of the British Association, the Illuminating Engineering Society and was honorary vice-president of the Electrical Exhibition at Frankfort in 1891 and British delegate to the Electrical Congress in Chicago in 1893. He was a member of the Athenaeum Club and was the founder of the Gilbert Club, being one of its honorary secretaries. Dr. Thompson's writings included biographies of Michael Faraday and Lord Kelvin, in addition to many technical works on dynamo-electric machinery, the electromagnet and optical subjects. His first book published in 1883, "Elementary Lessons in Electricity and Magnetism," reached a circulation of more than 40,000 copies. In 1886 he began the publication of his treatise on "Dynamo-Electric Machinery," which is in its eighth edition. The wide range of subjects covered by Dr. Thompson in his writings won for him several awards from scientific bodies, as also have many of his discoveries. Dr. Thompson was a man of very agreeable personality.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

PORTLAND, ME.—The Public Utilities Commission has been petitioned by the Cumberland County Power & Light Company for permission to issue and sell $350,000 in bonds.

HOLLIS, N. H.—The Hollis Electric Light Company has applied to the Secretary of State for incorporation, with a capital stock of $5,000.

LOWELL, MASS.—The Lowell Electric Light Corporation is constructing a three-phase, 2,000-kilovolt-ampere, 11,000-volt power line from its station to North Chelmsford, about five miles, 2.5 miles being underground conduit. This will provide additional power service to an industrial community that is rapidly growing, a number of the factories being devoted to iron and steel products.

MARLBORO, MASS.—The Boston & Western Street Railway is projected to be built between here and Waltham, about 15 miles, making a direct route from Boston. A committee of the Board of Trade of this city is co-operating with a committee of Waltham citizens to secure the building of the road.

SPRINGFIELD, MASS.—Contracts for the new power plant of the United Electric Light Company, which will be built at the foot of Bliss Street, have been awarded, the general contract being let to the A. E. Stephens Company, of this city. It is estimated that the entire work will cost $750,000.

HARTFORD, CONN.—The Hartford (Conn.) Electric Light Company's directors have voted to recommend to stockholders an increase of $900,000 in capital stock, making a total of $4,500,000. The 9,000 shares would be offered to stockholders of record at par value. The recommendation will be acted upon June 27.

THOMPSONVILLE, CONN.—An improved lighting system consisting of 24 iron posts, each supporting three large incandescent units, is being considered, a special committee having recommended such a system, to cost about $2,800.

EAST SYRACUSE, N. Y.—A modern electric-lighting system will be established here about September 1, work on the new system to begin in a few days. The Syracuse Lighting Company will install the system.

LANCASTER, N. Y.—The Depew and Lancaster Light, Power & Conduit Company, has applied for a franchise to establish an electric-lighting system in Elma, N. Y. It is proposed to give electric service in the towns of Springbrook, Elma Center, East Elma, Blossom and Jamison Road. The company has filed a petition with the Public Service Commission for authority to issue $72,000 of its five-per-cent 40-year gold bonds under an existing mortgage of $1,000,000.

PULASKI, N. Y.—The Pulaski Electric Light Company, of which J. H. Costello is superintendent, is considering plans for the installation of street-lighting systems in Lacona and Sandy Creek, N. Y.

WAVERLY, N. Y.—The Board of Trustees and F. S. Nicholson, manager of the Sayre Electric Company, are considering plans for extensions to the local electric-lighting system.

MADISON, N. J.—Borough Council will install a municipal underground conduit system in Lincoln Place and vicinity.

RIVERDALE, N. J.—Borough officials are negotiating with the Butler Common Council for the extension of the Butler municipal electric system to Riverdale and vicinity.

TRENTON, N. J.—Final plans have been adopted by the City Commission for the installation of a new arc-lamp street-lighting system on State Street, from Clinton Street to State House, on Broad Street, from Greenwood Avenue to Battle Monument, and south on Warren Street to Factory Street. The Public Service Electric Company will make the installation.

CHESTER, PA.—The Beacon Light Company, a subsidiary of the General Electric Company, has acquired a large tract of river-front property, and plans for the erection of a new power plant.

CONNELLSVILLE, PA.—The recent approval by the Public Service Commission of the incorporation of a score or more of power companies in Fayette, Greene and Washington Counties paves the way for the extension of the West Penn Power Company's transmission lines to sections of Southwestern Pennsylvania not now being served. The tapping of the new territory, with its accompanying demand for additional power, will probably revive the project to build the Cheat River power plant, which was abandoned several years ago.

ERIE, PA.—J. B. Brooks and others, of this city, are stockholders in the Sugar Creek Township Power Company, which was recently chartered to supply electrical energy for light and power in Sugar Creek Township. The company is capitalized at $5,000.

HAZELTON, PA.—The Rosell Silk Mill Company will build a large addition to its plant. Steam operation will be supplanted by electric power; individual motors will be installed for all machinery.

HEGINS, PA.—The Public Service Commission has approved of the incorporation of the Hegins Township Electric Company, to install and operate a light and power system.

LANSFORD, PA.—The City Council has passed an ordinance granting the Panther Valley Electric Light Company, of this city, permission to erect high-tension transmission lines through this city to the company's new $45,000 substation.

PHILADELPHIA, PA.—The Hunting Park Improvement Association is negotiating with the City Council for the installation of street lights in the York Road bridge district.

POTTSTOWN, PA.—William M. Rutter will build an electric lighting plant for local service. A site has been selected at the former grist mill.

WEST CHESTER, PA.—The North Coventry Electric Company has been incorporated with a capital of $5,000 by J. C. Murtagh, of this city, to operate in North Coventry Township.

KINSTON, N. C.—Extensions and improvements to the municipal electric-lighting plant, costing approximately $40,000, have just been completed. The capacity of the plant has been quadrupled and considerable reserve power for manufacturing purposes is now available.

COLUMBIA, S. C.—The Carolina Rapid Transit Company has been incorporated with a capital of $50,000 by J. F. Jacobs, W. L. Gray and others. The company proposes to construct an electric railway through Laurens, Spartanburg and Union Counties.

AUGUSTA, GA.—C. A. Wickersham and associates have accepted the conditions of the city ordinance regarding the construction and operation of a terminal railway and have made application for the incorporation of the Savannah River Terminal Company with a capital of $100,000. Considerable electrical construction work will be necessary.

SAVANNAH, GA.—Extensions to the city electric-lighting system are being considered by Chief Engineer E. R. Conant.

PLANT CITY, FLA.—E. V. Capps, representing the Jaudon Engineering Company, has made a report on the survey of the city for a combined municipal electric-lighting and waterworks plant. The total cost is estimated at $91,000.

ST. CLOUD, FLA.—The Central Florida Interurban Railway Company has been incorporated by C. E. Carlton, W. S. Alyea and others. The company proposes to build an electric railway between St. Cloud and Tampa by way of Sanford and Dunnellon; also through Volusia County to a point on the coast, and through Osceola and Brevard Counties.

NORTH CENTRAL STATES.

CINCINNATI, O.—The city service department is working out an estimate of the cost of the proposed boulevard lighting system for the entire downtown business section of the city, the city council having ordered this to be done. Indications are that the system will be constructed.

LONDON, O.—The inadequacy of the city electric plant to the present needs of the city will probably result in improvements being made to enlarge its capacity and extend the distributing system.

SALEM, O.—The Salem Lighting Company, a newly organized concern, has been given authority by the Public Utilities Commission to issue $150,000 in common stock and $150,000 in first-mortgage bonds, the proceeds to be applied to the purchase of the Salem Electric Light & Power Company and the Columbiana Electric Company.

LEROY, ILL.—Plans are being discussed here for the erection of a municipal electric-lighting plant.

OTTAWA, ILL.—The Council is considering ordinances requiring the placing of all electric wires underground in the business district.

PERRY, ILL.—The Perry Light & Power Company has been incorporated with a capital of $5,000 by J. I. Vertrees and others to furnish electric service here.

SPRINGFIELD, ILL.—The city will purchase a new generating unit to be installed at the pumping station. Specifications for a 750-kilovolt-ampere unit have been approved by the City Council and bids will be received June 27. The city budget ordinance contains an appropriation of $20,000 for the unit.

GRAND RAPIDS, MICH.—B. E. Parks & Son, engineers of this city, are preparing plans for rebuilding the power plant of the Eagle-Ottawa Leather Company at White Hall. New boilers will be installed at this plant. They are also preparing plans for increasing the capacity of the same company's pant at Grand Haven. Plans also are being prepared for a power plant for the Cadillac (Mich.) Machine Company.

HANCOCK, MICH.—The Common Council has received estimates for the erection of a municipal electric-lighting plant and has decided to employ an electrical engineer to draw up plans. The preliminary estimate calls for an expenditure of $40,000 for the system.

ELKHORN, WIS.—The Wisconsin Gas & Electric Company has recently installed transmission lines to this city and 24-hour service is now being given. The city is planning to purchase a 40 and a 75-horse-power motor for its pumping plant.

KINGSTON, WIS.—The Ripon (Wis.) Light & Water Company has secured an option on the local electric-lighting plant. It is the intention of the company to connect the two plants and also furnish electrical energy to the towns of Markesan and Dalton.

FERGUS FALLS, MINN.—The Otter Tail Power Company, of this city, is negotiating for the purchase of the municipal electric-lighting plant at Perham, Minn. The company is planning to erect transmission lines to Perham and Deer Creek, through Underwood, Battle Creek, Clitherall and Henning.

CLINTON, IOWA.—Plans are being considered to install ornamental lamps in Fifth Avenue during the summer.

CLINTON, IOWA.—The Albany Lighting Company has been incorporated with a capital of $10,000 by C. E. Peck and others.

DES MOINES, IOWA.—The Southern Iowa Electric Company, with principal offices in Wilmingham, Del., and western offices in Omaha, Neb., has filed notices of incorporation in this state. The company is capitalized at $500,000 and W. B. Roberts is secretary.

BONNE TERRE, MO.—The Public Serv-

ice Commission has under advisement the purchase of the local electric-lighting system by the Light & Development Company, of St. Louis. If the Commission approves of the transfer the company will enlarge the plant to supply energy to the mining districts in this territory.

ST. JOSEPH, MO.—The Board of Public Works contemplates repairs to the street-lighting system.

ELKHART, KANS.—An issue of $5,000 in bonds has been sold, the proceeds to be used for an electric-lighting system here.

PLYMOUTH, NEB.—A committee has been appointed by the Village Board to investigate the matter of securing an electric-lighting plant for this city.

SHUBERT, NEB.—The City Council is planning ways and means to secure an electric-lighting system here.

VALENTINE, NEB.—Plans are being considered here for improvements to the municipal electric-lighting plant and extensions of the distribution system.

HARTFORD, S. D.—The Northern States Power Company has been granted permission by the County Commissioners to construct and operate for a period of 20 years a transmission line between Sioux Falls and this city.

SOUTH CENTRAL STATES.

GLASGOW, KY.—Basil Richardson, W. L. Porter and R. H. Porter have organized a new telephone company known as the Glasgow Telephone Company, with $100,000 capital and propose to take over the plants of the Glasgow Telephone Company and the Gainsboro Telephone Company, which together operate about 2,200 stations in Glasgow and Barren County, Ky.

HORSE CAVE, KY.—The Horse Cave Light & Ice Company has been incorporated by J. P. Todd, M. G. Todd and W. C. Davis, with $25,000 capital.

LOUISVILLE, KY.—Improvement of the lighting and heating plant of Jefferson County, at Louisville, will be limited this year to an expenditure of $3,000 in the way of repairs, with the probability that a new plant will be provided next year. Brinton B. Davis, architect, will superintend the work.

NEWPORT, KY.—A number of new lamps will be installed and other changes will be made by the city in connection with a rearrangement of the street-lighting system, designed to give more efficient service with the same number of lights now in use. Old lamps will be replaced.

NASHVILLE, TENN.—The City Commission is considering an ordinance which would provide for a bond issue of $1,500,000 with which to erect a municipal electric lighting plant. Commissioners Leo Goodman, Ennis M. Douglas and George C. Love have made an inspection of the municipal plant at Cleveland, O.

BIRMINGHAM, ALA.—At an election held recently the voters authorized the issuance of $500,000 in bonds, the proceeds to pay for extensions in the North Birmingham electric-lighting plant.

BIRMINGHAM, ALA.—The work on the new steam power plant of the Alabama Power Company, which is to be constructed on the Warrior River at a cost of $1,500,000, has been commenced. A. R. Gilchrist is the engineer in charge of the construction of the plant. It is expected that the plant will be ready for operation in about nine months.

HOPE, ARK.—The City Council is planning a number of extensions and improvements to the street-lighting system.

SHERMAN, TEX.—An election will be held this week to vote on the question of issuing $10,000 in bonds for a street-lighting system.

SNYDER, TEX.—Extensions to the city electric-lighting system are being contemplated.

TEXAS CITY, TEX.—Plans and specifications for a proposed street-lighting system have been presented to the City Commission.

WESTERN STATES.

BAINVILLE, MONT.—Plans are being made for the installation of an electric-lighting plant here. S. J. Dorothy, of Williston, N. D., is interested.

GLASGOW, MONT.—The Hinsdale Water & Light Improvement District has been created by the County Commissioners of Valley County, and plans for the installation of an electric lighting plant and distributing system in Hinsdale and unincorporated towns are being prepared. Tentative plans announced for the construction of lighting plant call for poles, lines, transformers, generators, switchboards, engines, etc. A waterworks system is also planned for the town of Hinsdale.

GREAT FALLS, MONT.—The City Council is planning an installation of additional street-lighting units.

LENOX, MONT.—It is reported the Helena Light & Railway Company of Helena plans the extension of its electric-lighting lines to Lenox. W. L. Callaghan is manager.

THOMPSON FALLS, MONT.—It is reported that by September 1, 1916, the Holter plant of the Montana Power Company, near Thompson Falls, Mont., will be furnishing not less than 50,000 horsepower. It is understood the third and fourth units are now being installed and that each of the six units which will comprise the completed plant will furnish 6,250 kilowatts. The work is being rushed at the plant, and plans for the construction of a high-power transmission line up Cow Creek and over the divide to Saltese are being prepared. The line to Saltese will supply current for operation of trains over the line of the Chicago, Milwaukee & St. Paul Railway Company.

PASCO, WASH.—W. S. Bear, local manager of the Pacific States Telephone & Telegraph Company, reports his company will immediately begin installing a new system in Pasco. Present lines will be rebuilt and additional equipment installed at a cost of about $25,000.

SEATTLE, WASH.—The City Council of Seattle recently made a tour of inspection of the Hebb power site on White River, under the personal direction of P. H. Hebb, of Tacoma, owner of the site, who has tried unsuccessfully for several years to sell this site to the city of Seattle for a price approximating $1,000,000. The City Council of 1912, after inspecting the site, decided if same was purchased, it would be only after condemnation proceedings had been instituted. The Hebb site is one of the several sites which J. D. Ross, superintendent of lighting, has under consideration as an adjunct to the present municipal lighting plant, which is considered inadequate to care for constantly increasing business.

SPOKANE, WASH.—City Council has been petitioned for the installation of an ornamental curb-lighting system on Main Avenue, between Division and Monroe Streets and Morton McCartney, city engineer, has been instructed to prepare plans and specifications and estimates of cost for the proposed improvement.

TACOMA, WASH.—The construction of a 250-horsepower electric-lighting plant on Van Trump Creek to serve both Paradise Valley and Glacier camps in the Rainier National Park will begin shortly. The plant will be installed by the Rainier National Park Company of Tacoma, Wash., and will cost $8,000.

TACOMA, WASH.—The application of the Puget Sound Traction, Light & Power Company for a franchise to construct a power line in Pierce County was heard by the Commissioners on June 23.

ASTORIA, ORE.—The construction of a $50,000 central heating plant in Astoria is planned by C. H. Callender, and others of this city.

ARBUCKLE, CAL.—O. H. Guptill, manager in this district for the Northern California Power Company, has been signing up power users in the vicinity of Dunnigan with the intention of extending the company's lines from College City to Dunnigan, a distance of about 10 miles.

BLYTHE, CAL.—Plans are under way for the installation of an electric light plant here as soon as the town is incorporated.

CALEXICO, CAL.—It is stated that the new power plant of the Holton Power Company will be completed within 30 days. In addition to the new plant near Holtville, the company will have its gas and electric reserve plants at El Centro completely renovated and remodeled, greatly improving its equipment and service in the Valley.

FRESNO, CAL.—Announcement has been made by the San Joaquin Light & Power Company that extensions in the Fresno district that will cost approximately $75,000 will be under way in a short time. It is reported that about 65 miles of new lines will be put in, divided as follows: Fresno, 10.3 miles; Selma, Caruthers and Riverdale, 9 miles; Midway, 7.5 miles; Coccoran, 3.75 miles; Bakersfield, 5.2 miles; Madera, 4.8 miles; Dinuba, 2.3 miles; Merced, 3.6 miles; Livingston, 5 miles; Los Banos, 6 miles; Santa Maria, 7 miles.

LOS ANGELES, CAL.—In answer to petitions for better lighting of Monte Vista Park, city officials have instructed the petitioners that it would be necessary to form a lighting district in order to secure the proposed lights.

LOS ANGELES, CAL.—The city council has ordered ornamental lights installed on Washington Street from Main to Vermont Streets.

MARTINEZ, CAL.—The Martinez-Concord Interurban Railroad has been granted a franchise to construct the first unit of its electric railway system which will connect this city with Concord.

MERCED, CAL.—Lighting districts have been established in three unincorporated cities of Merced County by special elections recently; namely, Atwater, Le Grande and Dos Palos.

SAN ANSELMO, CAL.—A petition from property owners to install electroliers along San Anselmo and Dolinas Avenues has been referred to the street committee of the trustees.

SAN FRANCISCO, CAL.—Bids for supplying electric energy to the Board were canvassed and the awards made to the Pacific Gas & Electric Company and the City Electric Company for one year on schedules A and C and to the City Electric Company for three years on schedule B.

SANTA ANA, CAL.—Agitation, which it is thought will sooner or later result in a single telephone system in Santa Ana, Anaheim, Long Beach, San Bernardino and Ventura, has begun. It is understood that petitions will soon be circulated in Long Beach asking the city commissioners for a single system either by merging the two companies now in operation, or providing a municipal system.

CANADA.

PRINCE GEORGE, B. C.—Bids for power-plant equipment to be installed in the municipal plant at Prince George will be received by John A. Turner, city clerk, until 12 o'clock noon, July 8. Specifications and forms of tender may be obtained from city clerk or from Du Cane, Dutcher & Company, Rogers Building, Vancouver, B. C., consulting engineers, who will have charge of the installation.

DATES AHEAD.

American Institute of Electrical Engineers. Annual convention, Hollenden Hotel, Cleveland, O., June 27-30. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Public Utilities Association of West Virginia. Annual convention, Parkersburg, W. Va., July 12-14. Secretary, W. C. Davisson, Charleston, W. Va.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 18-21. Secretary, D. L. Gaskill, Greenville, O.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 19-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

International Association of Municipal Electricians. Annual convention, Baltimore, Md., August 22-25. Secretary, C. R. George, Houston, Tex.

Pennsylvania Electric Association. Annual convention, Eagles Mere, Pa., September 5-8. Secretary, H. N. Muller, Duquesne Light Company, Pittsburgh, Pa.

Illuminating Engineering Society. Annual convention, Philadelphia, Pa., September 18-21. Secretary, C. A. Littlefield, Irving Place and Fifteenth Street, New York City.

Association of Iron and Steel Electrical Engineers. Annual convention, Chicago, Ill., September 18-22. Secretary, W. O. Oschmann, Oliver Steel & Foundry Company, Pittsburgh, Pa.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 21,345. ELECTRICAL APPARATUS, ETC.—A firm in Holland wishes to represent in Scandinavian countries American manufacturers and exporters of electrical machinery, electrical novelties, electric fans, valves, gauges, general hardware, and novelties of all kinds. Reference is furnished.

NO. 21,372. ELECTRIC TRAMWAY.—An American consular officer abroad reports the publication in a foreign trade journal of an announcement relative to the proposed construction of an electric tramway in Bilbao, Spain, connecting the existing system with the Irala-Barri district. The minimum rolling stock required to commence the operation of the line is one motor and one trailer coach for passengers and one motor freight car and two trailer freight cars. Construction work must be commenced within three months and completed within 18 months from the date of the award of the concession. An option on the concession is held by the "Sociedad Tranvia Urbano de Bilbao." Although the bids for this work were to be opened on May 19, 1916, and the contract has no doubt already been awarded, it will nevertheless involve the purchase of some materials from other countries. The Bureau has no further information in regard to this opportunity.

NO. 21,379. ELECTRICAL APPARATUS, ETC.—A firm in Cuba is desirous of representing American manufacturers of electric motors, gasoline motors, electric fans, boats, and electrical supplies.

NO. 21,397. SCIENTIFIC APPARATUS, ETC.—An American consular officer in Spain reports that a firm in his district, which deals in scientific apparatus and materials of all kinds, is desirous of importing small electrical material, incandescent lamps, insulators, electromedical apparatus, apparatus for electric heating and domestic use, electric ventilators and electric motors. Correspondence may be in English. References are furnished.

Proposal

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9,790, Brooklyn, N. Y., 20 radio transmitting sets. Schedule 9,793, Philadelphia, Pa., 20 portable ventilating sets. Schedule 9,796, Norfolk, Va., four turbogenerating sets. Schedule 9,798, Mare Island, Cal., three 0.5-kilowatt motor-generator sets. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the Purchasing Office nearest to navy yard where delivery is to be made.

New Incorporations

NEW YORK, N. Y.—Martin Electrical Manufacturing Company. Capital, $50,000. Incorporators: Ralph Martin, 1063 Simpson Street, Bronx, N. Y.; J. J. Murphy and Harvey C. Price, of New York City.

WHEELING, W. VA.—Saylor Electric & Manufacturing Company. Capital, $25,000. Incorporators: F. D. Saylor, W. L. Saylor and others.

ST. LOUIS, MO.—Thomas H. Keffel Manufacturing Company. Capital, $100,000. Manufacture and deal in electrical machines and appliances. Incorporators: Thomas H. Keffel, C. D. Halley, J. M. Smith and others.

REINBECK, IOWA.—Iowa Peerless Electric Sign Company. Capital, $125,000. Manufacture and operate talking electric signs. Incorporators: R. L. Turner, F. W. Webb and S. W. DeWolf.

CLARKSTON, WASH.—Idaho-Washington Water, Light & Power Company, of Boston, Mass., and Clarkston, Wash. Capital, $1,200,000. Incorporators: B. T. Stephenson, L. B. Hardman and P. C. Ulman.

DOLGEVILLE, N. Y.—Dolgeville Electric Supply Company. Capital, $3,000. Incorporators: C. H. Mosher and others.

CEDAR POINT, O.—Cedar Point Utilities Company. Capital, $10,000. Incorporators: E. B. King, R. K. Ramsey, H. A. Dunn and others.

SOUTH BEND, IND.—Kale & Bryan Company. Capital, $10,000. Manufacture electric signs. Incorporators: W. E. Bryan, Fred Kale and J. F. Devine.

CLEVELAND, O.—Cleveland Power Transmission Company. Capital, $10,000. Incorporators: B. V. Selby, E. E. Lenarz, E. H. Krueger, H. J. Nord and A. L. Winsper.

NEW YORK, N. Y.—Artistic Lighting Fixture Corporation. Capital, $25,000. Manufacture electrical fixtures, etc. Incorporators: S. H. Shinsky, M. Shuman and N. W. Coan.

Financial Notes

N. W. Halsey & Company have purchased $4,000,000 first-mortgage 5-per-cent bonds of the Kansas City Railways Company, due 1944. An offering syndicate has been formed and the bonds are being sold at a price of 98 and interest.

Santa Barbara Gas & Electric Company has been authorized by the California Railroad Commission to issue $1,000,000 serial bonds at not less than 91. The proceeds are to be used to retire the company's outstanding $824,500 bonds at 105 and the balance will go to reimburse the treasury for expenditures made from income for capital account.

At the annual meeting of the stockholders of the Westinghouse Electric & Manufacturing Company, retiring directors were re-elected for four years. Guy E. Tripp was made chairman of the board. The stockholders confirmed the election of Samuel M. Vauclain, vice-president of the Baldwin Locomotive Works, who was elected to the unexpired term of three years of Charles F. Brooker, retired.

Toronto Electric Light Company has sold to William A. Read & Company and Dominion Securities Company, Ltd., $1,000,000 first-mortgage three-year five-per-cent gold bonds. The issue is for the purpose of retiring a similar amount of bonds maturing July 1. Toronto Electric Light Company does a light and power business in city of Toronto in competition with the Provincial Government's system. The city of Toronto has the option of purchasing the company in 1919 at a price to be fixed by arbitration, failing agreement as to price between the company and the city. The company's gross earnings in 1915 were $1,320,085.

Dividends.

	Term	Rate	Payable
American Cities	S	1.5 %	July 1
American Gas & Elec., com.	Q	2.5 %	July 1
American Gas & Elec., com. (extra)	—	2 %	July 1
American Gas & Elec., pf.	Q	1.5 %	Aug. 1
Ark. Lt. & Pw., pf.	Q	1.75%	July 1
Asheville Pw. & Lt., pf.	Q	1.75%	July 1
Baltimore Elec., pf.	Q	1.25%	July 1
Bell Tel. of Canada	Q	2 %	July 15
Bost. & Worcester El., pf.	S	$1.50	July 1
Carolina Pw. & Lt., pf.	Q	1.75%	July 1
Cleveland Ry.	Q	1.5 %	July 1
Columbus Pw., pf.	Q	1.75%	June 15
Commonwealth Pw., Ry. & Lt., pf.	Q	1.5 %	Aug. 1
Commonwealth Pw., Ry. & Lt., com.	Q	1 %	Aug. 1
Con. Gas, Elec. Light & Pw., com.	Q	1.75%	July 1
Consumers Pw., pf.	Q	1.5 %	July 1
Gas & Elec. Securities, pf.	—	14 %	July 1
Gas & El. Securities, com.	—	12 %	July 1
National Gas, Elec. Lt. & Pw., pf.	Q	1.5 %	July 1
National Gas, Elec. Lt. & Pw., com.	Q	1 %	July 1
New York State Rys., pf.	Q	1.25%	July 1
New York State Rys., com.	Q	1.25%	July 1
Northern Ontario Lt. & Pw., pf.	—	3 %	July 15
Northern States Pw., com.	—	1.5 %	July 20
Northwestern Elec., pf.	Q	1.5 %	July 1
Northwestern Pw., pf.	—	$1.50	July 1
Southern Utilities, pf.	Q	1.75%	July 1
United Gas Improvement	Q	2 %	July 15
Western Pw. Corp., pf.	Q	1 %	July 15
Western Union Telegraph	Q	1.25%	July 15
West Penn Trac., pf., ex.	—	3 %	Aug. 15
West Penn Trac., pf., ex.	—	3 %	Sept. 15

Reports of Earnings.

FEDERAL LIGHT & TRACTION.

Federal Light & Traction Company and subsidiaries report consolidated earnings for April and the four months ended April 30 as follows:

	1916	1915
April gross	$203,175	$190,021
Net after taxes	68,089	63,320
Interest charges	48,723	49,008
Surplus	19,366	14,312
Four months' gross	861,788	822,103
Net after taxes	286,947	289,702
Interest charges	195,396	199,509
Surplus	91,551	90,195

BELL TELEPHONE.

Income account of Bell Telephone System in United States for April, 1916, and four months compares as follows:

April:	1916	1915
Exchange revenue	$15,479,833	$14,003,337
Toll revenue	5,669,166	5,188,990
Miscellaneous revenue	220,456	196,799
Total operating revenue	21,369,455	19,389,126
Operating expenses	13,962,238	12,741,117
Net operating revenue	7,407,217	6,648,009
Net after taxes	6,110,539	5,447,237
Four months:		
Exchange revenue	60,874,924	55,291,277
Toll revenue	22,010,920	19,358,031
Miscellaneous revenue	867,931	747,403
Total operating revenue	83,753,775	75,396,711
Operating expenses	54,685,089	49,868,609
Net operating revenue	29,068,686	25,528,102
Net after taxes	23,859,030	20,682,256
Miles wire owned	18,757,378	17,716,033
Bell stations owned	6,190,383	5,698,897
Bell connected stations	3,215,700	3,105,324
Total stations	9,406,083	8,804,221

MIDDLE WEST UTILITIES.

Middle West Utilities Company reports for the year ended April 30, 1916, compare as follows:

Combined earnings of subsidiaries:	1916	1915
Gross earnings	$8,091,149	$7,634,745
Operating expenses, taxes and rentals	5,205,034	4,877,016
Net earnings	2,886,115	2,757,728
Interest paid outside holders	1,339,412	1,307,629
Amortization	24,642	----
Dividends paid outside holders, and their proportion of earnings	206,093	310,428
Balance accruing to Middle West Utilities Company	1,315,968	1,139,672
Income of Middle West Utilities Company:		
Interest received and accrued	503,070	437,123
Dividends received and accrued	456,480	364,135
Sundry interest	247,629	276,680
Profit from sale of securities	139,694	332,030
Income in book value securities	54,000	----
Profit from sale of property to subsidiary companies	100,116	33,956
Securities received for services rendered	119,900	----
Fees for engineering and other services to subsidiaries	26,796	84,932
Total income	1,642,686	1,528,855
Administration expense, taxes, etc.	190,704	168,855
Interest on collateral notes and bonds	328,576	215,287
Interest on loans, etc.	122,121	163,396
Net income	1,001,286	981,317
Dividends on preferred stock	599,062	598,048
Discount on company's own securities	85,000	80,000
Balance	317,224	303,268
Previous surplus	1,081,132	777,864
Total surplus	1,398,356	1,081,132
Middle West Utilities property, amortization of undivided surplus of subsidiary companies for year	130,730	78,504

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	June 19.	June 12.
American Tel. & Tel. (New York)	130⅝	129½
Commonwealth Edison (Chicago)	141	141
Edison Electric Illuminating (Boston)	238	238
Electric Storage Battery common (Philadelphia)	65¾	64½
Electric Storage Battery preferred (Philadelphia)	65¾	64½
General Electric (New York)	169	169
Kings County Electric (New York)	130	130
Massachusetts Electric common (Boston)	6	6
Massachusetts Electric preferred (Boston)	34½	34
National Carbon common (Chicago)	170	170
National Carbon preferred (Chicago)	123	122
New England Telephone (Boston)	134½	134
Philadelphia Electric (Philadelphia)	27½	27⅞
Postal Telegraph and Cables common (New York)	81	80½
Postal Telegraph and Cables preferred (New York)	68¼	68
Western Union (New York)	94¼	94⅝
Westinghouse common (New York)	60⅝	61¼
Westinghouse preferred (New York)	70	70

New Publications

JOURNALISM.—The addresses made at the Fourth Annual Newspaper Institute, held at the University of Washington, Seattle, in January, 1916, have been published in the University *Bulletin* for May under the general title, "Ethical Aspects of Journalism."

FOREIGN TRADE.—The official report of the Third National Foreign Trade Convention, which was held in New Orleans in January, has been issued. It constitutes a bound volume of 530 pages, containing the addresses and discussions in full. The secretary is R. H. Patchin, India House, Hanover Square, New York City.

OSCILLATING-CURRENT CIRCUITS.—An abstract of a thesis on this topic has been published by V. Bush at the Massachusetts Institute of Technology. It is an extension of the theory of generalized angular velocities with applications to the coupled circuit and the artificial transmission line.

MAGNETIC OBSERVATIONS.—The United States Coast and Geodetic Survey has published the results of observations made at the Magnetic Observatory at Sitka, Alaska, in 1913 and 1914, by Daniel L. Hazard. Hourly values of the components of the earth's field are given, with summaries and with reports of earthquakes and magnetic storms.

BUREAU OF STANDARDS.—Scientific papers Nos. 276 and 279 of the Bureau of Standards, Washington, D. C., are entitled respectively "Protected Thermo-Elements," by Arthur W. Gray, and "Distribution of Energy in the Visible Spectrum of an Acetylene Flame," by W. W. Coblentz and W. B. Emerson. The first describes in detail a convenient mounting for protecting laboratory thermo-elements from damage by contamination or by mechanical strains. The second gives the spectral composition of the acetylene flame.

COMMERCIAL REGISTER.—The twenty-fourth annual edition of "Hendricks' Commercial Register" has come to hand. It is devoted especially to the interests of electrical and other engineering industries, architects, contractors, etc. It should prove useful to both buyers and sellers through its lists of producers, dealers, manufacturers and consumers. It is published by S. E. Hendricks Company, Incorporated, 2 West Thirteenth Street, New York, N. Y.

Electrical Patents Issued June 13, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,186,532. Electrical Conduit. C. W. Abbott, assignor to American Conduit Co., Pittsburgh, Pa. Structure of joint.

1,186,541. Time-Recorder. J. W. Bryce, assignor to International Time Recording Co., Endicott, N. Y. Mechanism for operating elapsed-time indicators.

1,186,542. Dynamoelectric Machine. J. W. Burleigh, Rowbarton, Taunton, England. Structure of field with interpoles.

1,186,561. Electromagnet. C. T. Evans, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Single electromagnetic winding with several control circuits.

1,186,563. Automatic Common-Battery Telephone Exchange. E. D. Fales, assignor to First Trust & Savings Bank, Chicago, Ill. Arrangement of connector-switch, relays, etc.

1,186,568. Spark Plug. F. M. Furber, Revere, Mass. Special structure with insulator secured in casing by frictional grip.

1,186,574. Rail Bond. T. Haulton, Wilkinsburg, Pa. Has improved connection with rails.

1,186,585 and 1,186,586. Electric Switch. C. J. Klein, assignor to Cutler-Hammer Mfg. Co. First patent: details of snap switch for sockets. Second patent: two-push-button, snap, flush switch.

1,186,605. Lamp. L. L. Pfeifer, assignor to John W. Brown Mfg. Co., Columbus, O. Structure of headlight casing.

1,186,618. Electric Regulator. L. L. Tatum, assignor to Cutler-Hammer Mfg. Co. Resistance controlled by electromagnets uniformly set but interconnected to produce successive operation.

1,186,629. Method Used in the Manufacture of Paper and Such Like by Machinery Together with an Apparatus for the Purpose. J. H. Wallin and K. Granqvist, Kopmanholmen, Sweden. Method of regulating feed of pulp to machine and electrically indicating thickness of pulp therein.

1,186,636. Switch Lock. G. B. Willcox, Saginaw, Mich. Anti-tampering, locking attachment.

1,186,639. Constant-Speed Integrator. D. R. Yarnall, assignor to Yarnall-Waring Co., Philadelphia, Pa. Mechanism for integrating volume of current flow, driven by electric motor.

1,186,654. Means For Producing Phase-Shifted Oscillations in a Plurality of Independent Oscillation-Circuits. A. Franke, Berlin, Germany. Number of wireless transmitters have currents of different phase supplied to them respectively from generator having frequency a submultiple of antenna frequency, frequency of generator being multiplied to transmitter.

1,186,658. Speed-Control System For Electric Traction Motors. J. E. Haschke, Chicago, Ill. Connections and switching mechanism for sectional-wound field coils.

1,186,701. Spark Plug. H. M. Spencer, Dunmore, Pa. Structural details.

1,186,704. Trolley Guard. C. M. Swelberg, Yonkers, N. Y. Guard wheels carried by trolley support at sides and above trolley wheel.

1,186,710. Electric Water-Heater. S. Trood, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Thermostatically controlled valve governs liquid flow into electrically heated casing.

1,186,712. Antifriction Bearing Structure For Electric Motors. J. N. Vandegrift, assignor to Railway Roller Bearing Co., Syracuse, N. Y. Arrangement of thrust and journal bearings in frame.

1,186,728. Method of Constructing Terminals. W. M. Austin, assignor to Westinghouse Electric & Mfg. Co. One-piece terminal for receiving number of conductors.

1,186,734. Canopy Insulation. E. E. Bechtold, Chicago, Ill. For fixture canopies.

1,186,746. Telephone Transmitter. C. L. Chisholm, London, Ont., Canada. Arrangement of diaphragm and granule chamber.

1,186,747. High-Potential Rectifier. L. W. Chubb, assignor to Westinghouse Electric & Mfg. Co. Arrangement of electrolytic cells in groups so that uniform, external static field is produced.

1,186,755. Electric Locomotive. J. L. C. Davis, assignor to Westinghouse Electric & Mfg. Co. Structure of motor having number of symmetrically arranged armatures.

1,186,765. Electrical Measuring Device. C. L. G. Fortescue, assignor to Westinghouse Electric & Mfg. Co. For measuring maximum value of voltage wave.

1,186,766. Target. A. O. Gihre, Christiania, Norway. Rings of target may rock and close indicator circuit.

1,186,767. Electrical Measuring Instrument. W. S. Gorton, assignor to Westinghouse Electric & Mfg. Co. For measuring maximum value of voltage wave; comprises mercury rectifiers supplying to instrument direct current proportional to alternating current through a condenser.

1,186,769. Circuit Closer for Mail-Box Alarms. S. F. Gulley, Lawrence, Kans.

No. 1,186,862.—Insulator.

Details of mechanism for operation by door or lid.

1,186,770. Circuit-Interrupter. F. D. Hallock, assignor to Westinghouse Electric & Mfg. Co. Switch having contacts provided with magnetic members for holding contacts together.

1,186,772. Electric Indicator For Mail Boxes. M. Hammons, LaPorte, Ind. Normally open annunciator circuit can be closed by push button except when article is in box.

1,186,773. Electric Self-Feeding Soldering Iron. H. H. Harris, Oconto, Wis. Relates to details of feeding liquid solder melted electrically in chamber in iron.

1,186,791. Charging System for Electrolytic Lightning Arresters. R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co. Horn gaps in series with arresters and resistor thrown in circuit when gap bridged.

1,186,804. Equalizing Means for Dynamoelectric Machines. B. G. Lamme, assignor to Westinghouse Electric & Mfg. Co. Polyphase windings have number of sections per phase, the terminals of the sections being connected to terminals of corresponding sections of an inductive winding.

1,186,817. Semi-Automatic Telephone System. E. A. Mellinger, assignor to Automatic Electric Co., Chicago, Ill. Arrangement of calling device in cord circuit to be plugged into trunk jacks and line and master switches for selecting an idle trunk.

1,186,818. Regulating System For Electric Machines of the Revolving-Field Type. F. W. Meyer, assignor to Westinghouse Electric & Mfg. Co. Distributed field winding having phase divisions and armature with commutator and brushes corresponding to phase divisions, different parts of field winding being made active or inactive at will.

1,186,819. System of Distribution. F. W. Meyer, assignor to Westinghouse Electric & Mfg. Co. Induction motor regulated by gearing to machine as above and having secondary connected to armature of machine by slip rings, and the armature connected through commutation with the motor supply.

1,186,823. Measured-Service Telephone System. F. Newforth, Jr., assignor to Automatic Electric Co., Chicago, Ill. For automatic systems.

1,186,844. Automatic Cab Signaling and Train-Stopping Mechanism. A. P. Sanborn and R. C. Wilson, Ossining, N. Y. Block system having caution and danger signals and electrically controlled air valve.

1,186,851. Synchronizer. M. L. Severy, Arlington Heights, Mass. Current pulsator for vibrating tuned sonorous body, is regulated to constant speed to synchronize pulsations with natural period of body.

1,186,852. Switch For Portable Lamp. G. B. Slocum, assignor to Waterbury Mfg. Co., Waterbury, Conn. Details of flashlight switch.

1,186,857. High-Tension Strain Insulator. L. Steinberger, Brooklyn, N. Y. Has interchangeable parts adapting it for connection in different ways to objects of different shapes.

1,186,859. Battery Box. R. J. Stephenson, assignor to Stephenson Supply Co., Inc., Auburn, N. Y. Details of structure with several battery compartments.

1,186,862. Insulator. O. P. Swartz, Mount Pleasant, Pa. Details of knob with special provision for disposing of moisture. (See cut.)

1,186,881. Manufacture of Paper Board. L. W. Case, Highland Park, Conn. Method of forming insulating board for electrical use.

1,186,886. Electric Clock. J. Cook, Allendale, N. J. Gear train, etc.

1,186,890. Electric Regulation. J. L. Creveling, assignor to Safety Car Heating & Lighting Co., Jersey City, N. J. Resistance regulator for voltage regulation of car-lighting system.

1,186,898. Electrolytic Apparatus. W. E. Greenawalt, Denver, Colo. Has oscillating diaphragm between electrodes.

1,186,901. Ground Clamp. W. H. Higgins, Philadelphia, Pa. For making connection with water pipes, etc.

1,186,906. Web Guiding Means. E. P. Hopkins, assignor to Publishers Utilities Co., New York, N. Y. Motor and controller for shifting web laterally to regulate margin with relation to printing couple of press.

1,186,908. Automatic Selector Switch. C. A. W. Hultman, Stockholm, Sweden. For telephone system; structural details.

1,186,914. Dirigible Lamp. E. E. Krumbein, Womelsdorf, Pa. Housing has lamp, hood, etc., revolvable as unit therein.

1,186,916. Electric Sign. H. G. Lane and H. S. Williams, San Diego, Cal. Details of reflector and sign box.

1,186,921. Method For Synthetic Production of Cyanogen Compounds. A. R. Lindblad, Ludvika, Sweden. Electric furnace process.

1,186,923. Railway Signal. J. F. McElroy, Albany, N. Y., assignor to Consolidated Car Heating Co. Controlled by trolley-operated switches.

1,186,929. Coin-Operated Telephone Attachment. E. E. Murray, Shawville, Pa. Details of mechanism.

1,186,930. Electrical Switch Mechanism. W. J. Newton, assignor to Newton Mfg. Co., Lynbrook, N. Y. Push-button flush switch.

1,186,934. Temperature-Indicating Mechanism. H. Y. Norwood, assignor to Taylor Instrument Companies, Rochester, N. Y. Portable indicator has circuits selectively closed by several thermometers.

1,186,936 and 1,186,937. Electrolytic Apparatus. J. Pfleger and F. Ott, assignors to Roessler & Hasslacher Chemical Co., New York, N. Y. For electrolysis of fused alkali salts.

1,186,941. Electrically Operated Typewriter. P. C. Rawles, assignor to E. Hausberg, Charles City, Iowa. Typebars operated by electromagnets having circuits controlled by keys.

1,186,942. Gong. H. E. Reeve, Brooklyn, N. Y. Structural details of device having magnetically actuated hammer.

1,186,953. Sign Receptacle. J. S. Stewart, assignor to A. Stewart, New York, N. Y. Socket adapted for securing to sign plate.

1,186,959. Circuit-Breaker Relay. A. H. Weiss, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Operated as a buzzer on abnormal current flow.

1,186,961. Electrically Operated Bell For Submarine Signaling. E. C. Wood, assignor to Submarine Signal Co., Waterville, Me. Clapper operated from power accumulator which may be connected with constantly running motor at will.

1,186,986. Incandescent Lamp. G. F. Heustis, Malden, Mass. Cutout spring on stem held open by fusible resistance.

1,186,993. Apparatus For Producing Ultra-Violet Radiation. F. G. Keyes, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Means for regulating supply of hydrogen to point of use.

1,187,000. Viscoscometer. C. O. Lorenz, Port Arthur, Tex. Fluid heated and circulated by thermostatically controlled electric heater and motor.

1,187,010. Safety Plug. M. R. Rodrigues, Brooklyn, N. Y. For plugging into electric heaters, etc. (See cut.)

1,187,031. Air Compressor. S. D. Black, Baltimore, and A. G. Decker, Orangeville, Md. Mounting and gearing of electric motor.

1,187,035. Telegraphy. A. H. Bumstead, Townsend, and R. W. Bumstead, Brookline, Mass. Apparatus for sending succession of impulses at varying intervals according to code and recording in typographical form.

1,187,038. Safety Lamp and Direction Indicator For Vehicles. A. T. Butkey, Youngstown, O. Electromagnetically operated indicator.

1,187,053. Lock Socket For Electric-Light Bulbs. C. F. Dwyer, Ashland, W. Va. Locking shield thrown into and out of alinement with set screw.

1,187,054. Magnet Meter. R. J. Everest, assignor to Electric Equipment Co., Los Angeles, Cal. Deflection of armature by magnet to be tested moves pointer over scale.

1,187,078. Portable Pole-Platform. S. C. May, Modesto, Cal. For use of linemen.

1,187,083. Thermoelectric Switch. C. R. Murray, San Francisco, Cal. Alarm circuit held open by fuse.

1,187,095. Telephone System. F. N. Reeves, assignor to Western Electric Co., New York, N. Y. Details of automatic switching mechanism.

1,187,103. Casing For Portable Electric Flashlights. C. J. Sagebrecht, assignor to Interstate Electric Novelty Co., New York, N. Y. Structural details.

1,187,104 and 1,187,105. Electric Pocket Flashlight. C. J. Sagebrecht, assignor to Interstate Electric Novelty Co. First patent: Socket and reflector. Second patent: Special structure having connection through reflector.

1,187,111. Apparatus For Starting Internal-Combustion Engines. A. H. Timmerman, E. L. Coolidge and S. Sparrow, assignors to Wagner Electric Mfg. Co., St. Louis, Mo. Motor-dynamo connected to engine by different gearing ratios according to whether driving or driven.

1,187,116. Trolley-Retriever Valve. F. A. Wasson, Milwaukee, Wis. In pneumatically operated device; valve may be relieved to permit hand operation of trolley.

1,187,117. Trolley Base. F. A. Wasson, assignor to Wasson Engineering & Supply Co., Santa Rosa, Cal. Swivel base for trolleys retrieved by air pressure.

1,187,121. Electric Pocket Flashlight. E. Alschuler, assignor to Interstate Novelty Co. Arrangement of switch and lens support.

1,187,123. Combined Socket-Cover and Shade-Holder. L. W. Anderson, Waterbury, Conn. Structural details.

1,187,126. Lightning Arrester. A. F. Beattie, St. Michaels, Torquay, England. For protecting telephone, telegraph and like instruments.

1,187,127. Submarine Signaling Apparatus. C. Bergomer, assignor to Submarine Wireless Co., New York, N. Y. Structure of microphone box on hull below water line.

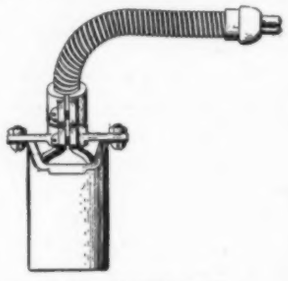
1,187,135. Release Box. J. H. Derby, New York, N. Y. Comprises series of bell-crank levers controlled by magnetic trip.

1,187,157. Apparatus For Aiding the Hearing. J. S. Leach, Brooklyn, N. Y. Device for connecting and locking conductor ends.

1,187,166. Cored Carbon With Arc-Extinguishing Plug. W. R. Mott, assignor to National Carbon Co., Cleveland, O. Plug of poor arc-supporting material in core to extinguish arc at given point.

1,187,169. Telegraph Circuit. A. Orling, assignor to Orling's Telegraph Instruments Syndicate, London, England. Relates to local receiving circuit.

1,187,178. Indicating Apparatus for the Spark Plugs of Hydrocarbon Engines. O. H. Remmert, Austin, Tex. Finding apparatus for spark plugs.



No. 1,187,010.—Safety Plug.

1,187,180. Means For Improving the Power-Factor of Induction Machines. A. Scherbius, assignor to Aktiengesellschaft Brown, Boveri & Cie, Baden, Switzerland. Special commutator phase-compensating machine having its brushes connected with brushes of induction motor on slip rings of wound rotor.

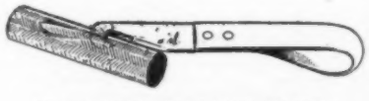
1,187,225. Manufacture of Abrasive Materials. T. B. Allen, assignor to General Abrasive Co., Niagara Falls, N. Y. Comprises fusing bauxite and carbonaceous material by electric heat.

1,187,228. Rheostat. A. J. Asch, New York, N. Y. Details of resistance tube with adjustable contact slider.

1,187,275. Drawing Steel Tubes. M. Derihom, Loncin-lez-Liege, Belgium. In drawing seamless tubes, electric current heats tube at drawing point.

1,187,282. Arc-Lamp Electrode. M. Doetch, assignor to C. Conradty, Nuremberg, Germany. Non-porous carbon has roughened surface to which chemical mixture adheres.

1,187,301. Lamp Grip. G. W. Goodridge, assignor to Bryant Electric Co., Bridgeport, Conn. Receptacle and segmental portions of shell restricted to grip lamp base.



No. 1,187,386.—Insulation Stripper.

1,187,303. Electrical Switch. C. O. Graham, Seattle, Wash. Automatic cutout for oil switch.

1,187,313. Search or Headlight. F. J. Heiberger, Boston, Mass., and M. C. Stuart, Richmond, Va. Pivoted shield at front of lamp body has magnetically controlled latch.

1,187,315. Electric Flasher. G. W. Henry, Jr., Philadelphia, Pa. Details of motor-driven switch mechanism.

1,137,330. Device For Locking Electric Lamp Bulbs in Receptacles. F. Jordan, San Francisco, Cal. Split gripping collar surrounding lamp end of receptacle.

1,187,334. Circuit-Closer. F. C. Keppler, Clifton, Ariz. Thermostatically operated for alarm circuit.

1,187,338. Switch Lock. B. C. Kreiner, Wascott, Wis. Contact-operating bolt operated by key.

1,187,367. Primary Current-Breaker for Magneto-Electric Ignition Devices. F. Munz, assignor to E. Scharrer, Cannstatt, Germany. Structural details.

1,187,368. Trolley Harp and Wheel Therefor. W. W. Neighbour, Sandusky, O. Manner of securing rim and side flanges to central spider.

1,187,372. Electric Brake System. O. E. Nilsen, Fargo, N. D. System having brakes operated from crosshead driven by electric motor.

1,187,377. Electrical Measuring Instrument. A. Onwood, Southfield, London, England. Structure of magnet and suspension of coil in D'Arsonval instrument.

1,187,386. Cable-Insulation Stripper. A. A. Pehrson, New York, N. Y. Blade resembles bill hook and handle connected at an oblique angle to sharpened edge. (See cut.)

1,187,400. Electric-Fan Deflector. R. E. Taylor, Chanute, Kans. Air-current deflector for electric fans.

1,187,404, 1,187,405 and 1,187,407. Electric Welding System. D. H. Wilson, Paterson, N. J. First patent: Arc system has means associated with welding tool for manipulating switchboard rheostat. Second patent: Arc system with variation of arc resistance compensated by automatic variation of potential. Third patent: Modification of 1,187,406.

1,187,406, 1,187,408 and 1,187,409. System of Electric Welding. D. H. Wilson, Paterson, N. J. First patent: Modification of 1,187,405, employing resistance. Second patent: Arc system with special provision for preventing rush of current at striking of arc. Third patent: Arc system has electro-responsive resistance variable to maintain smooth current flow.

1,187,410. Method of Electric Welding. D. H. Wilson. Arc started with maximum potential, current being limited to potential at which there is non-pitting, no slag formation, and no metal spattering.

1,187,411. Alloy for Arc Welding. D. H. Wilson and S. M. Rodgers; said Rodgers assignor to said Wilson. Homogeneous alloy for electrodes of iron, about one per cent manganese and copper.

1,187,412. Alloy for Arc Welding. D. H. Wilson. Iron homogeneously combined with sufficient manganese to give tensile strength and ductility in boiler-plate steel.

1,187,414. Machine for Wrapping Small Articles. J. R. C. August, Sowerby Bridge, England. Electromagnetically operated.

1,187,424. Safety Signal for Automobiles. H. F. Greenup, Pawtucket, R. I. Rear signal lamp controlled by brake rod.

1,187,439. Stabilizer. A. J. Macy, Chicago, Ill. Guiding means for aeroplane controlled by electric contact subject to close by freely movable ball elements as machine tilts.

1,187,473. Railway Signaling System. H. A. Wagner, Short Hills, N. J. Has conductively continuous track rails.

Reissue 14,151. System of Distribution. T. W. Varley, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Original No. 1,175,320, dated March 14, 1916. Special connections of three sets of transformer windings for phase transformation.

PATENTS EXPIRED.

The following United States electrical patents expired on June 20, 1916:

627,105. Apparatus for Lighting Car Lamps. H. C. Farquharson, New York, N. Y.

627,106. Apparatus for Electrically Lighting Lamps. H. C. Farquharson, New York, N. Y.

627,133. Electric Vehicle. W. M. McDougall, East Orange, N. J.

627,134. Secondary Battery. W. M. McDougall, East Orange, N. J.

627,144. Electric Transformer. G. A. Scheffer, Peoria, Ill.

627,155. Electrostatic Measuring Instrument. E. Thomson, Swampscott, Mass.

627,172. Telephone Toll Apparatus. J. T. Belanger, Detroit, Mich.

627,242. Electric Relay. H. B. Taylor, Newark, N. J.

627,243. Railway Signal. H. B. Taylor, Newark, N. J.

627,245. Railway Signal. J. Wayland, Newark, N. J.

627,246. Generating Electricity for Cars, Etc. J. Wayland, Newark, N. J.

627,252. Means for Lubricating Electric Motors. N. A. Christensen, Milwaukee, Wis.

627,266. Process of Producing Acid Chromate of Lead. C. Luckow, Cologne-Deutz, Germany.

627,267. Process of Producing Basic Phosphate of Copper by Means of Electrolysis. C. Luckow, Cologne-Deutz, Germany.

627,291. Driving Mechanism for Dynamos on Car Trucks. W. L. Bliss, New York, N. Y.

627,322. Thermostatic Instrument. C. Burgher, Winthrop, Mass.

627,326. Electric Lighting System for Cars. J. L. Creveling, New York, N. Y.

627,345. Generating Electric Waves for Vibrations. D. M. Moore, Newark, N. J.

627,366. Insulator for Fastening Electric Wires. J. Treleaven, Vancouver, Canada.

627,376. Controller. T. von Zweigbergk, Cleveland, O.

627,417. Electric Motor. A. Hinman, Forest City, Mo.

627,442. Process of Electrolytically Treating Ores. L. Pelatan, Paris, France.

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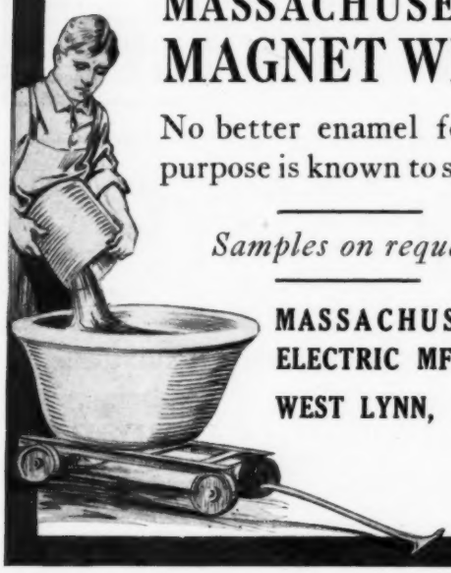

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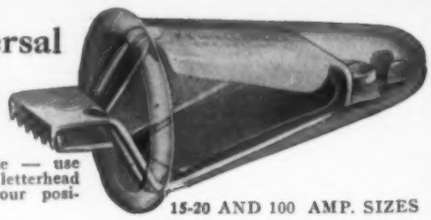

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Let us introduce the latest addition to the Esterline family of

Graphic Meters

This new line of instruments embodies our fifteen years experience in making graphic meters.

They represent the last word in meter design; small, rugged, accurate and light.

The whole instrument weighs less than 10 pounds.

The price is interesting.

Type "G.H." Esterline Graphic Meters

Are Made in All Types A. C. and D. C.

Ammeters Voltmeters Wattmeters

Special Single and Polyphase Wattmeters for Demand Service

Records in Ink.

Charts 25 feet long, 6 ins. wide.

Charts driven at uniform speed by high grade jeweled clock.

All parts interchangeable.

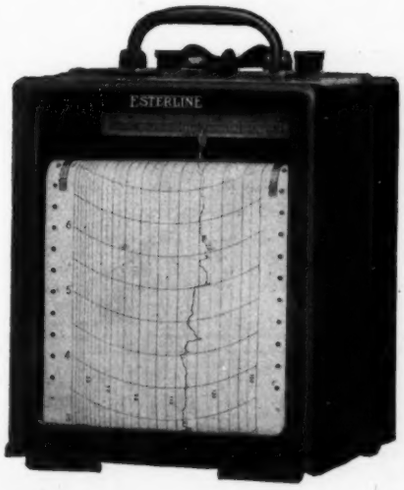
Very simple construction.

Voltmeters for A. C. or D. C.

Ammeters for use on A. C. with current transformers.

Ammeters for D. C. with shunts.

Wattmeters, single or polyphase, for A. C. or D. C. circuits.



Write Today for Catalogue 365R

The ESTERLINE Co.

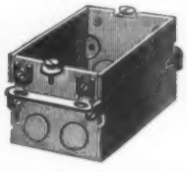
221 E. South Street **Indianapolis, Ind.**

UNION

Greetings of the Season to Our Good Friends and to Those We Hope to Add to that Number. .... May Our Products Serve as an Introduction?

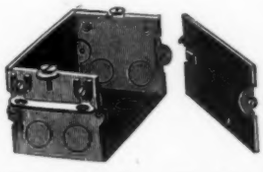
"UNION" FUSES

Approved by Underwriters and Public



"GEM"
Sectional Switch Boxes

Patented April 2, 1907; March 1, 1910; February 13, 1912



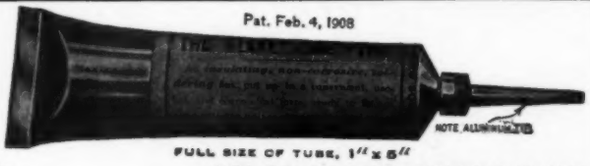
CHICAGO FUSE MANUFACTURING CO.

Chicago New York

Insulated Staples 5 Sizes Pat. Nov. 1900

BLAKE Specialties

STAPLES best for wiring. TUBE FLUX best Flux for soldering.



BLAKE SIGNAL & MFG. CO. Write for Samples 251 Causeway St., BOSTON, MASS.

Do Sodering?

Allen-Flux It

any metal include aluminum

One Reason: *Insures Perfect Joints* —Why *you* should sell buy it

L. B. ALLEN CO., INC., 4554 N. Lincoln St., Chicago, Ill., U. S. A.
In the Soderman's game since '93.

FUSES
Arresters
Voltage Detectors

High Voltage Specialties

SCHWEITZER & CONRAD, Inc.
1770 Berteau Avenue
CHICAGO

"DELTABESTON" MAGNET WIRE

round, flat, square, possesses every mechanical and electrical property that magnet wire should possess. Insulated with pure asbestos, the wire forms the best sort of "continuity of service" assurance. Glad to send samples.

"DELTATAPE"

has asbestos fiber as a base; it is impregnated with a special compound, and the tape can be raised to a temperature of 500 degrees Fahrenheit before decomposition begins. The flexibility of "Deltatape" makes it splendid for insulating coils.

DELTABESTON WIRE REG. U.S. PAT. OFF.

D & W FUSE CO. **Providence, R. I.**

DOSSERT CONNECTORS

The Superintendent of one of the largest electrical contracting firms writes us:

"The workmen have formed the habit of using DOSSERT CONNECTORS for all kinds of connections and consider it a hardship if they are called upon to perform the tedious and laborious task of making a soldered joint with its attendant acid fumes, gasoline torch smoke and burned fingers."

Ask the man who makes the Joints!

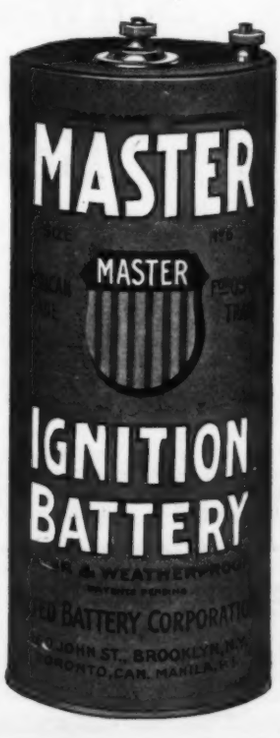
DOSSERT & COMPANY

H. B. LOGAN, President

242 West 41st Street, N. Y.

At Last—Water and Weather-Proof Batteries

For lasting satisfaction, try "Master" Flashlight Batteries.



These new batteries, being brought on the market at the beginning of 1916, are something entirely different in workmanship and appearance from anything else heretofore produced. They are offered the trade under the guarantee that if any of these "Master" Batteries should fail to give satisfaction for the work intended, we will either credit the amount, replace with new cells, or refund the money. Try us.

United Battery Corporation

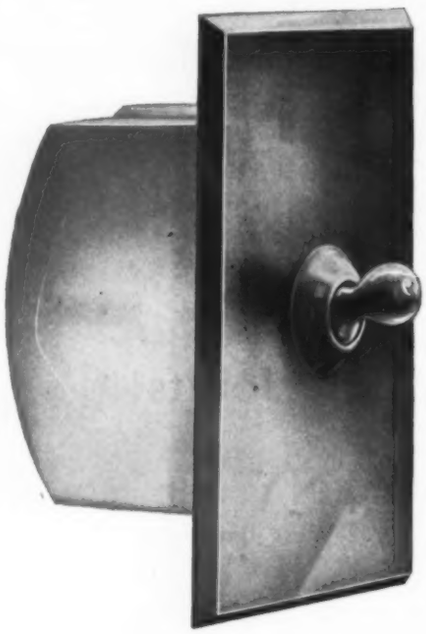
168 John Street
Brooklyn, New York

Chicago Office:

11-17 S. Desplaines Street

Guaranteed Tungsten-Flashlight batteries of every description.

Announcing



The New Toggle Switch

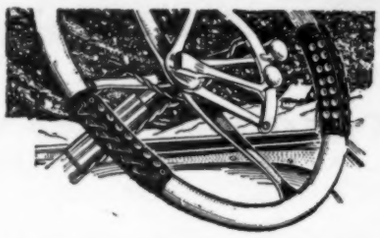
This form of switch is new in this country, but old in England and Continental Europe.

It is made for the first time in the United States in improved mechanical form and is approved.

A switch of high quality and artistic appearance, having a small plate and no fastening screws.

Prices and discounts on application

Newton Manufacturing Co.
Lynbrook, New York



Warm Hands With STEER WARMS

Steer Warms consist of two leather covered grips that lace on to the steering wheel at any place convenient for driving. They are electrically heated from storage battery or Ford magneto and cost nothing to maintain. Anybody can install them. No holes to bore. Lace on—wire up—that's all.

PRICE

For all gasoline cars . . $7.50
Special Ford Type . . . $5.00

When ordering, give voltage of battery. If Ford, whether 1915 or previous model.

GUARANTEE—Steer Warms are guaranteed for five years. Money refunded if not satisfactory.

DEALERS—This is the fastest selling accessory on the market. Write for dealers' discount and free offer of window displays, moving picture slides and folders.

INTERSTATE ELECTRIC CO.
310 Baronne St. New Orleans, La.

The

Schwarze Cyclone Bell

No. 6 D.C. and No. 7 A. C., being otherwise similar

This is in every sense a high grade Bell. It responds instantly, and stops as quickly, making it an ideal signalling bell. It is the loudest vibrating bell in existence. For Fire Alarm Companies, Factories and other uses where an absolutely dependable and loud toned bell is required, the "CYCLONE" answers every requirement.

Built in sizes from six to twelve inches. The Schwarze guarantee of superior design and construction covers our complete line of Bells, and it should offer a strong inducement to you and your trade.

Ask for our descriptive catalogue

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Main Office and Factory
Church St., Payne Ave. and Grace St.
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Eastern Representatives—
Electrical Sales Co., 719 Marbridge Bldg., New York.
Electrical Sales Co., 176 Federal St., Boston, Mass.

JOHNS-MANVILLE SERVICE

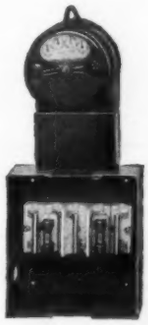
JOHNS-MANVILLE SERVICE COVERS THE CONTINENT

THE strength and efficiency of the Central Station largely determine its hold upon public appreciation and good will.

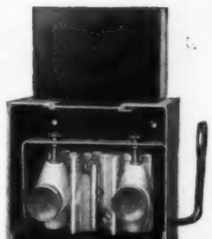
The efficiency of any organization is directly dependent on the efficiency of its equipment. Therefore, Johns-Manville Responsibility believes itself obligated to stand back of every J-M Product it supplies the Central Station.

The integrity and dependability of J-M Products are helping many a Central station to build up public good will. J-M Service can help YOUR company serve your community more efficiently.

Any Service appliance may be built up by various combinations of the units of the Noark Universal System



Three pole endorsed fused (solid neutral) service connection and meter testing cutout box (non-switching) with meter adapter. 0-30 Amp.



Two pole plug fused service and meter testing switch box with meter adapter. 0-30 Amp.

Switches or Cutouts may be two or three-pole with or without enclosing cabinet, the switch being operated from the inside or outside, the motor may be protected against tampering, the switch and cutout devices also serve for testing purposes, and any number of meters may be banked.

Another feature is the multi-functioning of one element: As SWITCH, CUTOUT, METER TESTING DEVICE, thereby eliminating over fifty per cent of the contacts now necessary to serve these three purposes.

Service appliances being reduced to fundamental units greatly limits the investment, as they may be made up as needed, the service installation may be changed, and the units and parts are never obsolete irrespective of changes.

Standardizing and unifying Service Connection Appliances means money to the central station.

Ask to have a J-M Service salesman show you the Universal system in all its details. Write for a Noark Universal System Catalog.

H. W. JOHNS-MANVILLE COMPANY

Akron	Boston	Columbus	Duluth	Kansas City	Minneapolis	Philadelphia	St. Paul	Toledo
Albany	Buffalo	Dallas	Galveston	Los Angeles	Newark	Pittsburgh	Salt Lake City	Washington
Atlanta	Chicago	Dayton	Houghton	Louisville	New Orleans	Portland	San Francisco	Wilkes-Barre
Baltimore	Cincinnati	Denver	Houston	Memphis	New York	Rochester	Seattle	Youngstown
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THE CANADIAN H. W. JOHNS-MANVILLE CO., LTD., Toronto, Winnipeg, Montreal, Vancouver.

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No Hunting for Bases, Caps, Leather Washers, Nails or Screws if you use

Nail-It

NAIL-IT and SCREW-IT

New and Old Code Types

THE ASSEMBLED KNOBS *READY FOR THE WIRE*

(Patent Applied For) **(Trade Mark Applied For)**

Every piece a complete unit in itself, ready to take the wire. Bases, caps, leather washers, nails or screws are assembled in a way that prevents their coming apart. "Ready for the Wire," that describes these time-saving knobs. One hand holds the assembled knob, leaving the other free for the hammer or screw driver.

Nail-It knobs carry ten-penny nails as standard. Twelve and sixteen penny nails supplied at slightly additional cost. Screw-It knobs are furnished standard with No. 10 3-inch screws.

Screw-It

No shortage of caps or bases. No nails, screws or washers to buy. Unit packages are nicely stocked and easily handled. Minimum breakage, as caps are extra heavy. Unit package, 500. Standard package, 8 Unit packages.

Try a Unit Package. Use the Knobs on Overhead Work.
We know now what your decision will be.

BUY THEM FROM ALL GOOD JOBBERS

Reversible Knobs

Standard Knobs
Split Knobs
Cleats
Tubes
Etc.

PORCELAIN

PATENTED

All Kinds of Telephone Knobs and Insulators

Insulators for Light and Power Lines Etc.

Send for our Catalog

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LOOK FOR ONE OF THESE MARKS ON PORCELAIN

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB ILLINOIS

Spark Plug Porcelains

in which is maintained the ***Cook Standard*** of quality. Write for free samples for testing purposes

The Cook Pottery Company
Manufacturers of Special Porcelain
Trenton New Jersey

"BUCKEYE" REVERSIBLE SPLIT KNOB

"BUCKEYE"

The new Split Knob

Some of its advantages:

Reversible—the two parts are exactly alike; saves matching tops and bottoms—and eliminates counting parts.

Interlocking—parts can not twist or get out of alignment while being installed or afterward.

The Buckeye is the only interlocking reversible knob having two wire grooves on the same plane.

Liberal screw protection—and may be installed with screws or nails.

Triangular Wire Grooves hold wire firmly without injuring insulation.

Neat appearing, light, yet strong.

Saves time and labor—lessens breakage expense—for a broken part does not destroy a whole knob.

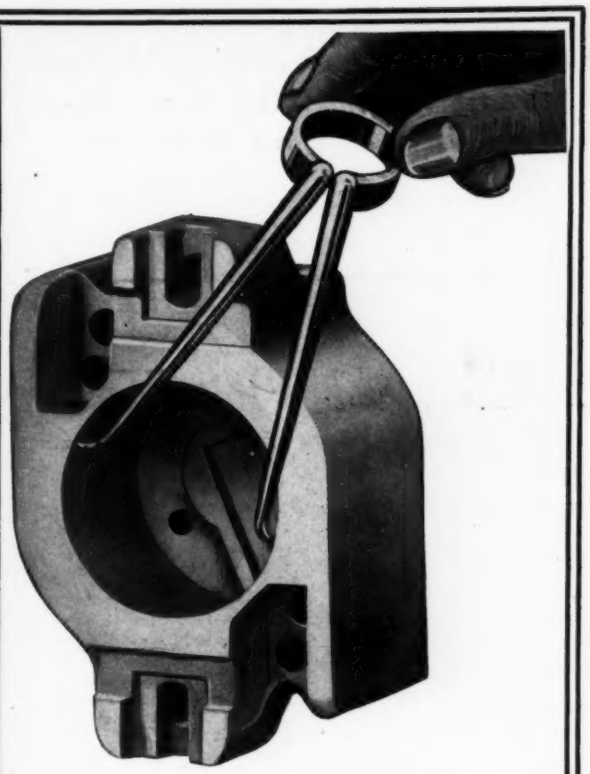
"The undersigned are the owners of the exclusive rights to manufacture and sell Interlocking Reversible Buckeye Knobs as shown in cut herewith, under patent of John W. Moore, No. 1,048,850, dated December 31, 1912 and under a patent pending. Any infringement of this knob by other manufacturers, dealers or users will be vigorously prosecuted.
THE FINDLAY ELECTRIC PORCELAIN CO."

Ask for Free Samples

We'll send you a sample knob, bulletin and price list. Just drop a postal.

The Findlay Electric Porcelain Company

Findlay, Ohio



Accuracy

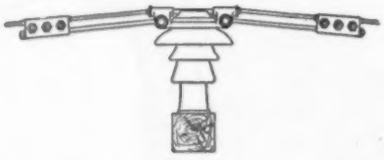
is the valuable essential you get if your pressed porcelain comes from the

Star Potteries

When one piece in all respects is as exactly like another as human skill and the most efficient machinery can produce, your wastage cost in assembling is bound to be materially reduced. Such accuracy of production distinguishes "Star" Porcelain and because the porcelain itself is uniformly of the highest quality, those electrical manufacturers who use our products are secured against unnecessary breakage and are able to market their goods with the knowledge that better porcelain parts cannot be put into them.

The
STAR
PORCELAIN COMPANY
TRENTON NEW JERSEY

"Dead End" Fastening Without Interfering With the Continuity of the Conductor



CLARK CLAMPING DEVICE

For Single Cross-Arming

is designed to meet the requirements of Railroads, Telephone and Telegraph Companies, where their lines are crossed by high-tension transmission lines and where single cross-arm construction is used. No "dead end" strain is thrown upon the main insulator. **Get Bulletin 25.**

For double cross-arm construction, consult your Bulletin Nos. 12, 20 and 24. Your inquiry will bring complete information about Clark Seamless Single Tube Splicing Sleeves, Split Connectors, Clamps, and other transmission and power specialties.

Write us today

The Clark Electric and Manufacturing Company
Singer Bldg., New York

Combination Conduit and Loom Box

SPRAGUE CONDUIT PRODUCTS

Include

Flexible and Rigid Conduits Armored Cable and Cord Boxes, Fittings and Tools

For

Every Requirement

Write for Pamphlet No. 4406

Sprague Electric Works

of GENERAL ELECTRIC CO.
Main Offices: 527-531 W. 34th St., New York, N. Y.
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Any capacity of re-fill desired instantly available by breaking off one or more strips of the

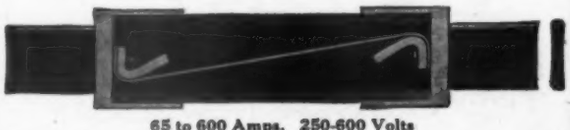
DAUM FUSE STRIP

AUM RENEWABLE FUSES

Ferrule or knife blade—simplest in design—easiest to refill.

Use being best proof, we ask you to send for free samples. Also ask for catalog and prices.

The A. F. Daum Co., Sole Mfrs., Pittsburgh, Pa.
Representatives: W. C. Squire & Co., Chicago, Ill.; Geo. H. Trask, San Francisco, Cal.



65 to 600 Amps. 250-600 Volts

Copper Blades Rounded Edges

Send Us Your Blue Prints of

SPECIAL PORCELAINS

We have a most up-to-date factory and can assure customers

Satisfactory and Quick Service at the minimum of cost.

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HEMMING INSULATION
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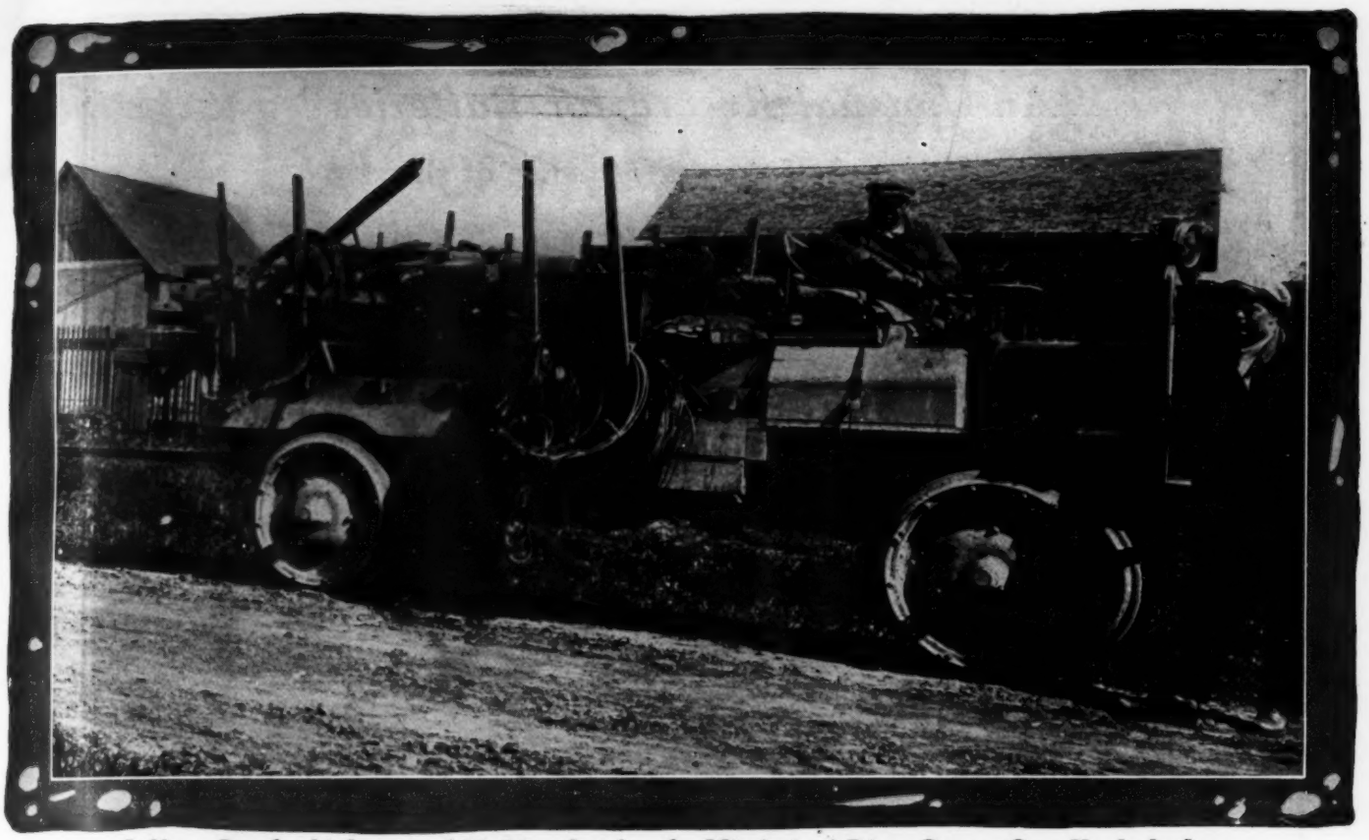
HEAT RESISTING MOLDED INSULATION

Made By Specialists Exclusively Devoted To Solving Your Molding Problems.

WHY NOT PROFIT BY OUR EXPERIENCE?

HEMMING MANUFACTURING CO.
GARFIELD, NEW JERSEY



Jeffery Quad which saves $15.00 a day for the Mississippi River Power Co., Keokuk, Iowa

Quad Saves $15.00 a Day

A SAVING of $15.00 a day is the record of the Jeffery Quad truck owned by the Mississippi River Power Company, Keokuk, Iowa. In other words, the Quad earns enough to pay off its original cost in nine months. This fine record is due to two things: 1. The good management and administration afforded by the Mississippi River Power Company to the Quad. 2. The fact that the Jeffery Quad *drives, brakes and steers on all four wheels.*

Recently a concern in Cedar Rapids, Iowa, bought a Jeffery Quad truck on the recommendation of Mr. C. A. Sears, General Superintendent of the Mississippi River Power Co. This is Mr. Sears letter which clinched the sale.

"We cannot speak too highly of the Jeffery Quad truck, which we have in use with the maintenance crew of our transmission line.

"This truck has now run over 5,000 miles without a cent being required for repairs. Some of the work has been done through the roughest kind of country.

"Before making the purchase of this truck, we looked into all of the standard makes, deciding first that under the conditions of country road work a chain drive would not be feasible. We are satisfied that our decision was correct and that the four wheel drive and steering is the only one which can be used with entire satisfaction through slippery and muddy roads."

The Jeffery Quad is not something new. It has been officially endorsed by the U.S. Government. It is being used commercially in 17 countries. Over 2,000 have been built, bought and delivered. It is the first motor truck to compete successfully with animal traction in places where other motor trucks are unable to travel. For further particulars apply to The Thomas B. Jeffery Company, Dept. E-1, Kenosha, Wis.

Jeffery Quad

Power on All Four Wheels

"An Unusual Record for Batteries"

A Record of the performance of six

"Ironclad-Exide" Batteries

in Electric Vehicle Trucking Service

WILMINGTON STEAMBOAT CO.
WILSON LINE
PASSENGER AND FREIGHT TRANSPORTATION
BETWEEN PHILADELPHIA AND WILMINGTON, DEL. WITH FREIGHT CONNECTIONS TO ALL POINTS EAST, SOUTH AND WEST

OFFICES:
FOURTH STREET WHARF
WILMINGTON, DEL.
CHESTNUT STREET WHARF
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HORACE WILSON
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S. K. SMITH
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W. S. MARTER
SEC'Y AND TREASURER
HARRY CRAWFORD
GEN'L PASS. AND FREIGHT AGENT

WILMINGTON, DEL.
September 23, 1915

The Electric Storage Battery Company,
Allegheny Avenue & 19th Street,
Philadelphia, Pa.

Gentlemen:

About a year ago we wrote you that we had in service six "Ironclad-Exide" Batteries of type 15-MV, which were placed in service January 1912. We wrote this letter at the time because we were so much pleased at having received approximately three years service. You can, therefore, imagine that we are still more gratified to tell you that another year has expired so that we have received approximately four years service. This we know is an unusual record for batteries in the very hard trucking service under which we operate. It is a well known fact that the ordinary storage battery for this kind of work would probably not give much more than a year's life.

Very truly yours,

WILMINGTON STEAMBOAT COMPANY,

BY J. S. Wilson

JSW-J

THE ELECTRIC STORAGE BATTERY CO.

Manufacturer of

The "Chloride Accumulator", The "Tudor Accumulator"
The "Exide", "Hycap-Exide", "Thin-Exide" and "Ironclad-Exide" Batteries

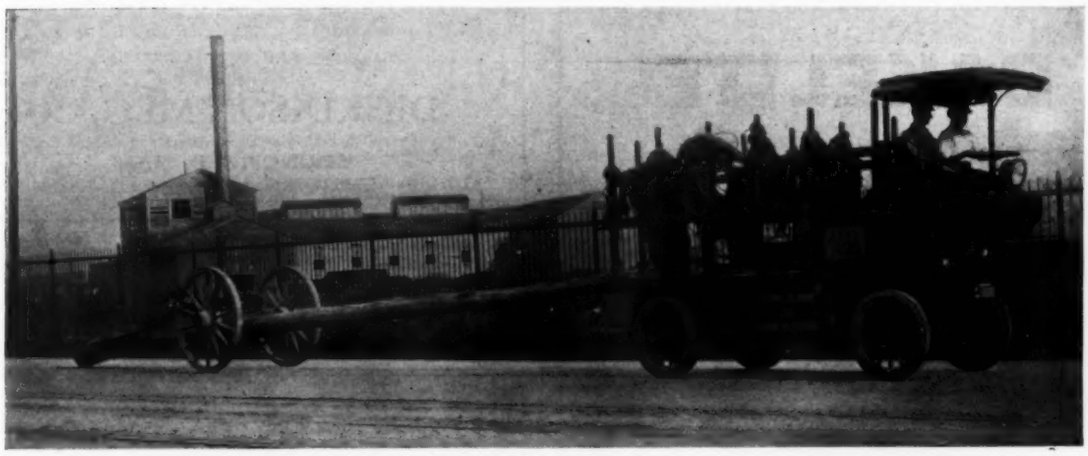
Boston Atlanta Rochester Cleveland PHILADELPHIA, PA. Chicago Denver St. Louis San Francisco
New York Washington Pittsburgh 1888-1915 Detroit Los Angeles Toronto

WHY THE G. V. ELECTRIC IS THE LOGICAL CENTRAL STATION TRUCK

Proven Efficiency: Built by old line manufacturer—15 years' experience. Nearly 1,000 used by Central Stations alone.

A Complete Line: Six capacities, 1,000 to 10,000 lbs. In addition to road trucks we build tower wagons, emergency wagons, winch equipped cable and pole trucks, Electric tractors and other specialties for public utility work.

Wide Distribution: Used in 44 states and 9 foreign countries. Our experience in 128 trades and in practically all Central Station districts enables us to intelligently co-operate in adapting G. V. Electrics to your work.



Two-ton G. V. Construction Truck Towing Pole. Speed, 10 miles; mileage 45-50.

Mileage: Even if you have sandy roads or steep grades we can give you motor and battery which will overcome these without greatly reducing mileage. We have conquered Pittsburgh, Cincinnati, Baltimore, San Francisco, etc.

Economy: Twice the speed and three times the life of a heavy trucking horse. Teamster drivers save high wages of chauffeur-mechanic. Tires last 25 per cent longer. Minimum insurance rates. Minimum repair bills. Maximum days on road each year.

Wears Best: The G. V. is the oldest and best Electric built. Bring your motor equipment problems to headquarters. How about a G. V. Agency for your town? Handsomely illustrated Catalogue No. 85 awaits your address.

General Vehicle Company, Inc.

General Office and Factory: **Long Island City, New York**

New York **Chicago** **Boston** **Philadelphia**

The Segments Can't Work Loose

Even at extremely high speeds, there's no danger of the parts working loose, for the steel sleeve and copper segments are embedded in

BAKELITE

The parts are moulded in at one operation, which gives great strength and reduces cost of manufacture—there's no expense for mica V-rings and no unprofitable motions in slow and expensive assembling.

19,000 revolutions per minute (the limit of the testing machine) didn't injure this commutator—not in the least.

BAKELITE MOULDED COMMUTATORS are very strong, impervious to moisture, dust and oils, and the insulation will not soften at the highest temperature in which electrical machinery operates. In fact, heat *hardens* **BAKELITE.**

GENERAL BAKELITE COMPANY
100 WILLIAM STREET, NEW YORK

55-125

WHEN YOU NEED Moulded Electrical Insulation

Send Blue Prints or Models and ask *us* to quote on *your* requirements.

DICKINSON MFG. CO.
Established 1875 as Dickinson Hard Rubber Co.
SPRINGFIELD, MASS.
KURT R. STERNBERG, Treasurer and General Manager

SHERWIN-WILLIAMS
AJAX

INSULATING MATERIALS

protect and make your insulating more enduring. A special insulating product for each special purpose — on every kind of electrical apparatus. Each product a tough elastic, high heat resisting varnish—giving the most protection and satisfaction possible. Our new booklet sent on request.

THE SHERWIN-WILLIAMS CO.
INSULATING MATERIAL MAKERS
781 CANAL ROAD CLEVELAND, OHIO

IT'S M. C. FRICTION TAPE

therefore it will retain its smooth, grippy action under all conditions the splice may be subjected to.

More M. C. TAPES are sold than any other brand, due to the fact that lighting and power companies, street railways and telephone companies realize that M. C. BRANDS are the most scientifically compounded tapes in the world. And there is a kind for every electrical use—one for cable connections, another for re-insulating armature wire, another for high tension lighting circuits, another for resisting alkalies, acids, etc.

In the arctics or the tropics M. C. TAPES "stay put."
Get the benefit of our advertising literature for the asking.

Walpole Tire & Rubber Co.

Massachusetts Chemical Co.'s Products

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Pioneers in Insulation Engineering

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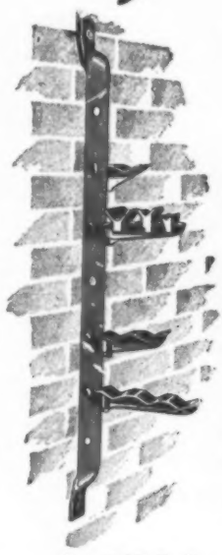

Cope Cable Rack.

For Underground Equipment

Get the result of twenty-eight years of underground conduit work. *It will mean a decided boost in your profits.*

Cope Underground Specialties include:
Quick Coupling Rods
Plain Screw Rods
Cable Racks
Cable Reel Jacks
Trench Jacks
Bond Wiring for Cables and Bond Attaching Plates
Winches for Pulling Cable
M. H. Capstans for Pulling Cable
Tamping Bars and Rammers
Manhole Guard Rails
Terminal Bells for Cables
Cable Pulling Protectors
Especially Prepared Wire for Pulling in Cables
Conduit Cleaning Tools
Metal and Wooden Duct Protectors

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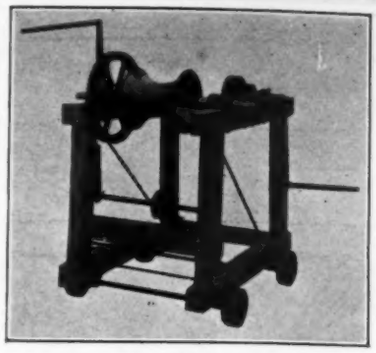
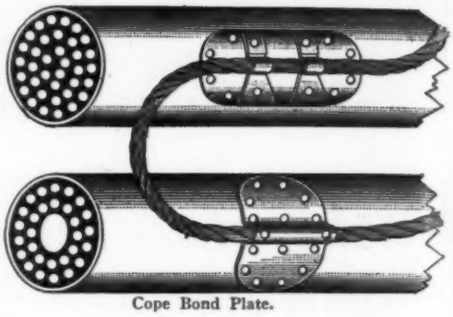


Cope Winch.



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"Subway construction is becoming a specialized branch of electrical engineering."

ORANGEBURG FIBRE CONDUIT

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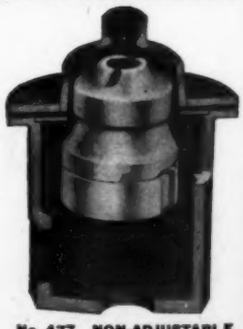

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Sherardized Rigid Steel Conduit

Used in the new Equitable Building

In constructing this, the largest office building in the world, all previous building efforts have been surpassed. Only the finest equipment is being installed—equipment safe, efficient and durable—and it is a significant fact that SHERARDUCT Sherardized Rigid Steel Conduit was selected and is being used exclusively throughout.

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S-2

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Have Stood the Test of Time
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Factories East and West enable us to figure reduced freight rates, assuring you of the lowest delivered prices without sacrificing quality in any way.

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CLEAN THREADS

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Every Man On the Job Likes Thread Protected Enameled Conduit

Each man appreciates the clean, free-from-enamel threads. They save his time and his temper.

Pittsburgh Standard Enameled Conduit, with its patented Thread Protectors, eliminates the tedious wasted hours spent standing at a vise running dies over pipe ends and reversing couplings. That is why every man likes

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Clean, Free-from-Enamel Threads Inside the Couplings

It reaches the job ready to use—no lost time, no wasted effort. Pittsburgh Standard is the highest grade enameled conduit, with all the trouble left out.

Pittsburgh Standard saves you money on every job, your men like it, and it costs no more than ordinary enameled conduit.

If you are not using this clean thread conduit you will want the interesting Pittsburgh Standard sample with its patented Thread Protectors. Write for it today.

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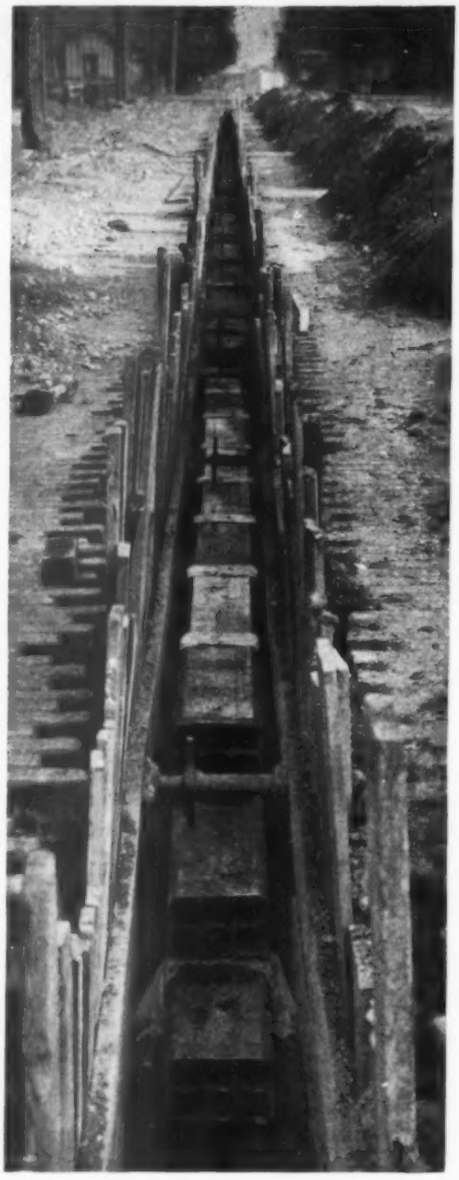
CUT COSTS



WITH expert crews, experienced in the peculiar requirements of underground transmission, your installation can be completed in a shorter period and at less expense than if you attempt to do the work yourself.

We can point to many installations in different parts of the country and in every instance—whether large or small installations—we were able to save money for the central station.

Every detail of the work may be turned over to us, from

"Specifications to Lights On"

Write us Now

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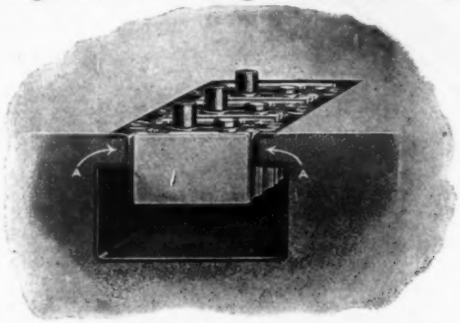
Columbia-Quality
Improved Gang Switch Box



The keyway "A" is the best improvement ever made in gang switch boxes. It keeps the plaster from breaking away around the plate.

THIS new improved gang switch box is so decided an improvement over previous gang switch boxes that no elaborate description is necessary.

Particular engineers and contractors will be quick to recognize the improvements in these gang switch boxes.

Prices? No higher than the old styles.
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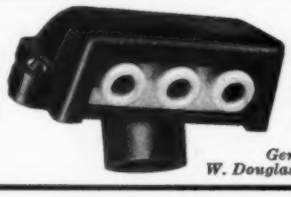

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Not only *inexpensive* in first cost, but also make a *quicker, better, neater-looking job.*
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Friction Tape, Splicing Compound, Armature Tape

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Concrete Anchors, Malleable Iron, Galvanized.
This Anchor is made so that concrete will flow through its walls, consequently they do not weaken the cross section of concrete.

Ground Clamps.
Made from No. 20 B. & S. gauge pure copper strap, ¾ in. wide; lugs integral and tinned. Makes perfect ground.

Offset Fixture Studs.
This Stud will give an adjustment of ¾ in. in any direction.

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Nothing but satisfaction has followed 18 years of use. Made from easy bending spellerized steel tube. Protected by coatings of enamel not affected by temperature conditions. Smooth enameled interior. Clean threads. Send for a sample —examine and test it.

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Made from spellerized mild steel tube in 10 ft. lengths, threaded and reamed at both ends with coupling on one end. A uniform deposit of pure non-corrosive zinc protects the pipe. The interior is free from blisters or obstructions, being a black enameled raceway. The smooth glossy finish allows rapid fishing without the slightest possible injury to the insulation of the conductors. Rethreading is unnecessary, as the clean, zinc-coated threads are free from enamel.

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Flexible Conduit

Practically indestructible by any mechanical agency. No matter how badly crushed, "Loomflex" can readily be pinched back into shape. Twist or bend it any way you please, the durable structure can't be injured. Its extreme flexibility allows it to be worked without trouble in hard places. Every foot can be used. Fishing wires through the smooth raceway of "Loomflex" is a snap. Get a sample for proof.

Ask for samples of the three products. They are time and money savers.

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Resolve now to make the New Year's installation work more profitable to you by using the flexible conduit fittings that meet all requirements of standard wiring on the job.

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They are Standard and Special Fittings In One

They save at least 25% over the cost of installing rigid conduit fittings, because no matter what the particular requirement calls for an ADAPTiBOX may be knocked down and re-assembled then and there in a few minutes to meet any ordinary or special demand arising on a conduit installation. No waiting, no men idle while a boy runs back to the stock room or the supply dealer for a special fitting.

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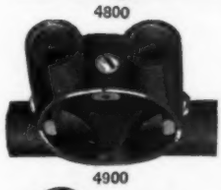
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ADAPTiBOXES

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Every man in its organization, every ounce of its resources, is available to give the utmost service to our customers.

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Every coil examined and labeled under the direction of the underwriters laboratories. Ignition wire for autos, motor boats and aeroplanes. *Send for booklet fully describing.*

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DECK CABLES
DROP WIRE
ELECTRIC HORN CORD
ELECTRIC LOCOMOTIVE CABLES
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For Fifteen Years

"American Brand"

Weather-Proof Wire and Cables

have shown uniform excellence

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American Insulated Wire & Cable Co.

21st, Sangamon and Morgan Sts.

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High Class Building

construction requirements as regards electric wires and cables are fully met when "Sterling" Rubber Insulated Wire is specified and used. One proof of this statement is the repeated indorsement of this wire by prominent architects, engineers and contractors who are putting

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into many of the largest and most noted buildings in the United States. Among these we mention a few: U. S. Customs House, N. Y.; U. S. Post Office, Washington, D. C.; Masonic Temple, Pittsburgh; Philadelphia Stock Exchange, Philadelphia

While suited as to quality for high class buildings, "Sterling" is a general purpose N. E. C. wire and is sold at a price which permits its use in the cheaper sort of buildings.

Samples and prices will be supplied upon request to our nearest office.

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Pittsburgh, Pa.

Boston	Atlanta	Chicago	Salt Lake City
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THE ACME WIRE COMPANY

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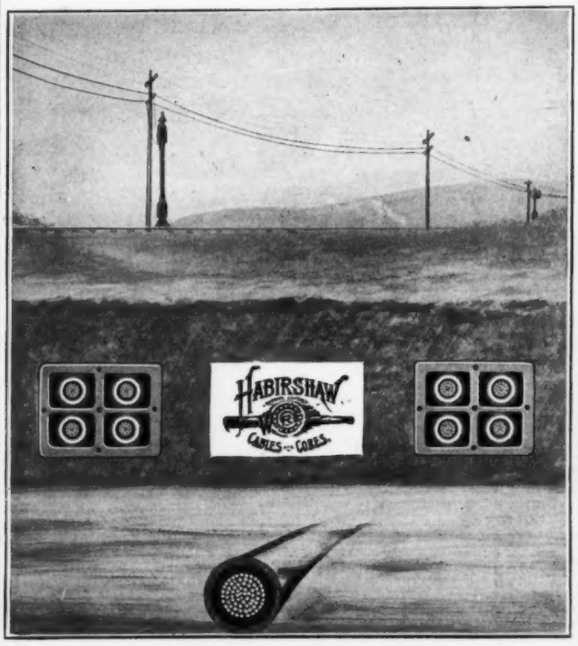

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For Aerial, Underground, Submarine, Mine, Building and Torpedo Purposes

Habirshaw Wire Company

Office and Works: Yonkers, N. Y.

Make the Way Safe and Bright with the MESCOLITE

Consists of a japanned metal container with cover, fibre disc with battery contacts, polished metal reflector, clear glass lens, miniature battery lamp, lens cap or rim with three bayonet catches, a RED SEAL Dry Battery and a handle large enough to allow the arm to go through it. The bail or handle cannot become detached. No condition exists where light and safety are required, that may not be more satisfactorily served with the MESCOLITE, than with any lamp, lantern or other similar illuminating medium.

It is the simplest battery lantern made. Positively fool proof. The battery cannot be inserted in the container in any other way than the RIGHT WAY. The slotted fibre disc prevents mistakes of this kind.

The contact points shown inside the cover are of unequal widths, so that it is absolutely impossible to close the circuit accidentally. After cap is placed on the container a turn of the button connects the lamp in circuit.

The fibre disc, with its two phosphor bronze connectors, is attached to the RED SEAL Dry Battery, the slotted part of the disc facing forward as it is being put into the container; a gentle push is all that is required to set it into place.

The MESCOLITE is made to take a RED SEAL Dry Battery, Size "A," and is supplied with a 1.5 volt lamp. The same container will also take a special two cell dry battery, and when so fitted, a 2.8 volt lamp is furnished with it.

Printed matter in colors showing the MESCOLITE with detailed description will be forwarded on receipt of request. Dealers desiring to have a supply with their names printed thereon (our name not shown), may have it by making request for quantity wanted.

Manhattan Electrical Supply Company

NEW YORK - - - 17 Park Place
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SAN FRANCISCO - 604 Mission Street

Factories: Jersey City, N. J.; Cincinnati, O.; Ravenna, O.

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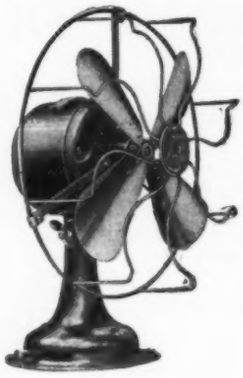

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We want to get in touch with a number of good, live jobbers and dealers, to act as our agents in the territories not already covered.

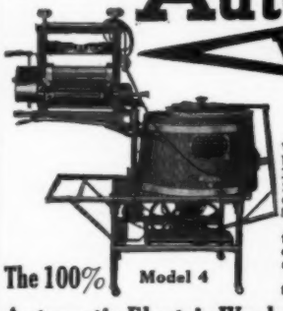
You know our line, it's complete. It's the fan the people ask for, therefore, it's the fan you ought to handle.

Write for our Catalog 106, and our 1916 contract form with price list

HUNTER FAN & MOTOR CO.

114-118 Liberty St.
NEW YORK

The 100% **AutoMatic** Washer



Is the QUALITY Washer
IT HAS NO EQUAL

This splendid AUTOMATIC Electric Washer, Model 4, has a compact short bench that FOLDS UP when not in use. Has full washing capacity and takes but 2 ft. sq. floor space. Has ALL up-to-date features, including the Reversible-Swinging Wringer.

Simple in design; faultless in construction; elegant in finish and perfect in operation, is easy to sell and its users are always satisfied. Six Models.

Send for Bulletin 161. It's FREE and tells the AUTOMATIC STORY.

The 100% Model 4

Automatic Electric Washer Co., Inc., Newton, Ia., U.S.A.

Over 100,000 Sold

SIMPLEX Electric Heating Pads

IMITATED but not Equaled.

There is a big field for its sale to Hospitals, Homes, Physicians' offices, Sanitariums, Hotels, etc.

Exclusive features described in our Sales Helps and Catalog

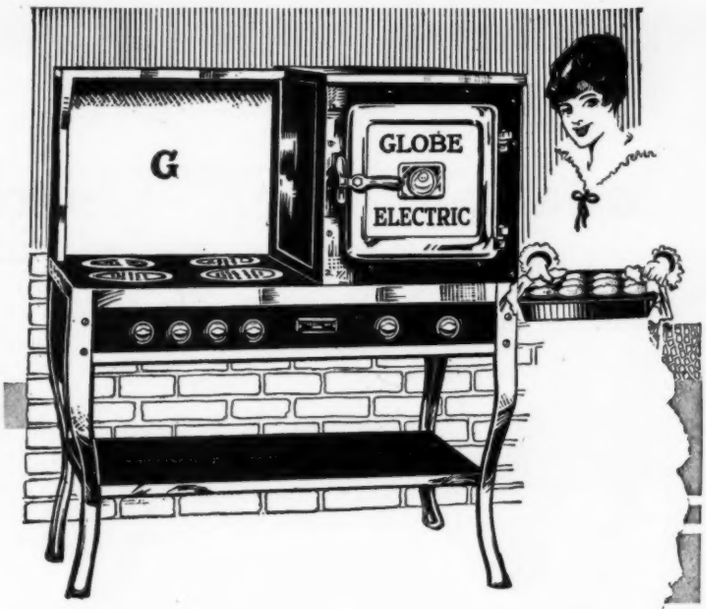
SIMPLEX QUALITY TRADE MARK

SIMPLEX ELECTRIC HEATING CO.

Mfrs. of Everything for Electric Heating and Cooking

15 S. Desplaines St. Chicago, Ill. **Cambridge, Mass.** 612 Howard St. San Francisco

This is one of the popular Globe Electrics, but you may like others better. See our catalog.



Matchless Flameless

THERE are a dozen styles of Globe Electrics shown in our big catalog. They range from a big, double-oven, nickel-and-white-enamel dreadnought to a small, one-unit hot plate. It is not variety, however, but satisfactory operation, that has put

GLOBE ELECTRIC
Stoves and Ranges

on display in the biggest electrical companies in America. These companies adopted and push Globe Electrics because the ranges have proved efficient, satisfaction-giving, and once sold, stay sold.

Before you decide on a range to push give thought to Globe. To your patrons the Globe trade mark stands for forty years' experience in making satisfactory cooking apparatus. A reputation you can cash in on if you act quickly.

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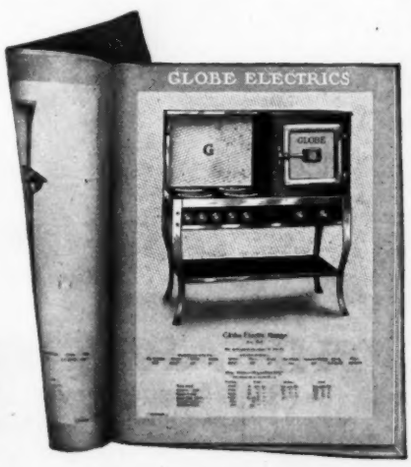
The Globe Electric Catalog is complete—is one of the handsomest range catalogs ever published. Send for it, and also let us explain the Globe Proposition to you. Act today and be a leader.

The Globe Stove and Range Co.
Kokomo, Indiana



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"Most Talked-of Cleaner on the Market Today."—Trade Journal.

THE Apex ELECTRIC CLEANER TRADE MARK

"Actually Takes the 'Work' Out of Housework."—A Proven Fact.

Install an "APEX" Electric Cleaner Dep't!

Sales Quick,—Profits Big,—and Customers Really Pleased!

Here's the most highly improved and thorough practical machine you can buy. It comes as a result of five years' close study and experience in vacuum cleaner building, and in remarkably short time has won enviable repute among dealers and housewives in every section of the country, for everyone is more or less familiar with the basic principles of suction cleaning and its many advantages, therefore the intense practicability of the APEX has always won attention from the very start.

Read These Points of Superiority!

1. The Apex Design

The over all height of the APEX is only six inches—lower no doubt than any other cleaner on the market. The nozzle is wide, low-down and long-nosed, cleans **under** things as well as **around** them—and may be adjusted to three variable positions—higher or lower—making it efficient on all floor coverings.

2. The Apex Motor

The APEX Universal series-type motor is extremely powerful; designed correctly. Horizontal type, trouble-proof and fool-proof, with rectangular brushes covering mininum segment area. 9,000 to 10,000 r. p. m. Same motor operates on 25 to 70 cycles or on direct current.

3. The Oiling System

Thru the APEX automatic ball oiler, oil is carried direct to an oil reservoir and is then fed to the bearings by wick and spring, insuring uniform application of oil until the very last drop in the reservoir is exhausted.

4. The Apex Suction

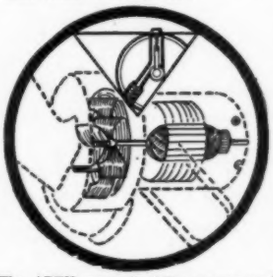
is wonderfully strong and evenly distributed. The base or pan of the cleaner is an inclined plane that follows straight lines. The air is maintained at the same density and velocity from the time it enters the machine until it reaches the bag,—so that lint, dirt, etc., has same suction force continuously applied.

5. The Apex Brush

—self-cleaning, is located in the mouth of the nozzle; it enables the Apex to pick up all forms of dirt that defy brooms and ordinary cleaners.

The APEX nozzle is divided into two passages which insures uniform suction across the entire 13-inch opening. Note the brush in the fore part of the nozzle.

The distinctive shape of the APEX nozzle permits it to "poke" under radiators, around casters, any place, every place to be cleaned.



The APEX motor is fully guaranteed in every respect, ample size—no danger of over-loading.

The APEX attachments include tools to thoroughly clean every fabric and surface—as well as for blowing dust and dirt out of inaccessible places.

DEALERS
Order an "APEX" on Trial

Try it—show it to a few of your customers — hear their comments—we'll gladly send an "APEX" for your inspection. Write us today.

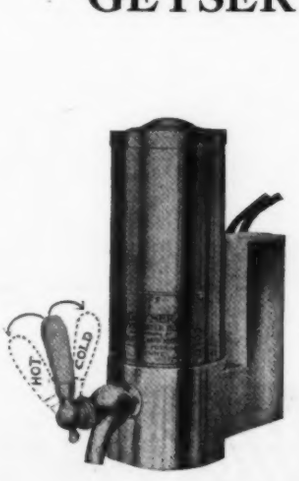
THE APEX ELECTRICAL MFG. CO.

Manufacturers of the APEX Electric Suction Cleaner

CLEVELAND, OHIO

INSTANTLY
The Hot Bath is Ready

One turn of the handle to the left and the "GEYSER ELECTRIC WATER HEATER"



delivers hot water in the quantity desired. Economy is reduced to its simplest factors. Quantity and temperature under absolute control. Turn handle to neutral position, current consumption ceases. Turned to the right, cold water flows from the tap.

For the bath, the kitchen, the doctor's or dentist's office, hospitals, barber shops, hotels, cafes, bars—anywhere that hot water is desired at a moment's notice, free from the contamination of a piping system and absolutely sterile.

No trouble to attach. Sell the "Geyser" as a primary or auxiliary water heating system everywhere that current is available.

Ask us today to send you full information

FELDMAN MANUFACTURING CO.

254 West 44th Street **New York**

Sew-E-Z Sewing Motor

Hamilton-Beach, Racine

This Simple Little Wonder Worker

Fits Any Sewing Machine

Changes Any Machine Into an Electric Self-Operating Labor Saver

Easily Adjusted— No Tools or Screws

So simple a child can operate it.

Just place the Sew-E-Z on any sewing machine next the hand wheel. Attach the plug to any electric light socket. Then place the little self starter on the floor. A light pressure of the foot starts the wheel, "press a bit harder to sew faster."

Anybody can attach it to any kind of sewing machine (old or new.)

Anybody can work it. No strength or energy required. No cramped position. Absolutely no strain on any vital organs.

Sew-E-Z is different; you have never seen anything like it. A universal motor with a reversing lever. You don't have to send an expert to attach and operate it.

5-Year Guarantee

Packed with every Sew-E-Z is our 5-year guarantee. Your assurance of absolute satisfaction.

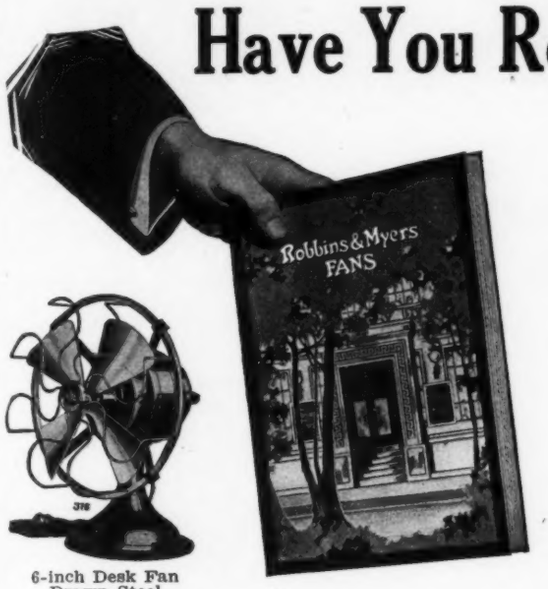
Dealers:—Write your jobbers for full details. Send for handsome display cards and consumers' literature with your imprint furnished free.

A National Advertising Campaign is creating a big demand. You want to be prepared.

Ask Your Jobber

Hamilton-Beach Mfg. Co.
Racine, Wis.

Have You Received Your Copy?

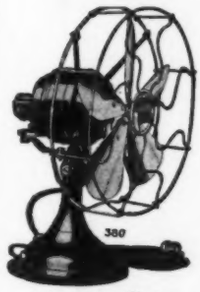


If you haven't received your copy of the new 1916 Robbins & Myers Fan Catalogue, let us know and we shall be glad to send you one.

It lists the season's most complete and up-to-date line of fans. Every desk and oscillating fan shown is a new 1916 design.

6-inch Desk Fan
Drawn Steel

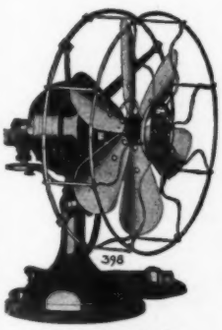
Among the new features are the six-inch desk fan and nine-inch oscillator—the two models which should be the biggest sellers ever produced.



9-inch Oscillator
Drawn Steel

Robbins & Myers Fans

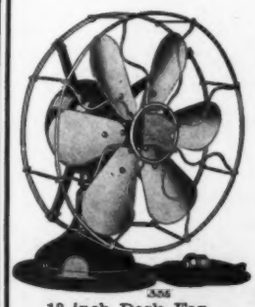
are now made in all sizes, in both the drawn steel and cast iron frame construction. In the R. & M. line there is a fan to fit every need at a price to fit every purse.



12-inch Oscillator
Drawn Steel

And Robbins & Myers Fans are advertised consistently in the leading National Weeklies. The dealer who handles them has the advantage which comes from selling a product which the public knows. When the dealer offers his customer a Robbins & Myers Fan, the customer knows he is getting a high quality product.

The line of advertising helps offered to dealers with R. & M. Fans this season is in keeping with the quality and up-to-dateness of the new line of fans. Ask to see samples.



12-inch Desk Fan
Drawn Steel

The Robbins & Myers Co.

Springfield, Ohio

New York Philadelphia Boston Rochester Cleveland
Cincinnati Chicago St. Louis San Francisco

DE VEAU — ORIGINATORS OF AUTOMATIC SWITCHLESS TELEPHONES — TELEPHONES

OKONITE — TRADE MARK REG. U.S. PAT. OFFICE — INSULATED WIRES AND CABLES

BERYLITE — TRADE MARK — GLASSWARE

DELTABESTON WIRE — REG. U.S. PAT. OFF. — MAGNET WIRE

PATTERSON BATTERY SETS

UNIVERSAL HEATING APPLIANCES

COLUMBIA MAZDA — INCANDESCENT LAMPS

WOOD-SYSTEMS FWEW FORT WAYNE, IND. — ELECTRICAL APPARATUS

Our Twenty-Ninth Year

No matter whether it is the insulation of a wire, a reflector for dir receptacle for difficult service or a protecting fuse, the "Central" are superior to most and inferior to none. They fulfill a purpose

OKONITE
TRADE MARK
REG. U.S. PATENT OFFICE.

Okonite Wires

Okonite and Manson Tapes

Are and have been for years the standard by which others are compared.

Okonite wire properly installed with Okonite and Manson Tapes gives permanence to the installation and a knowledge of security to the owner.

Send for catalog and prices.

MAXOLITE REFLECTORS

give the highest efficiency of which white fire-enameled steel is capable. Equipped with Type "R" fittings, they are easiest to wire, quickest to install and are weather and fume proof. Perfect ventilation is provided in all types. The ideal housing for Mazda C units.

Made in all styles. Send for bulletin and prices.

Send for data on our specialties — Okonite Wire, Berylite Glassware, D & W Fuses, Deltabeston Wire Central Ornamental Lamp Posts, Home Lighting Plants

Central Elec

320-326 South Fifth

Central Electric Company — MAXOLITE — Chicago

CH — CON-DULETS

"Sirocco" — TRADE MARK — MOTOR DRIVEN BLOWERS

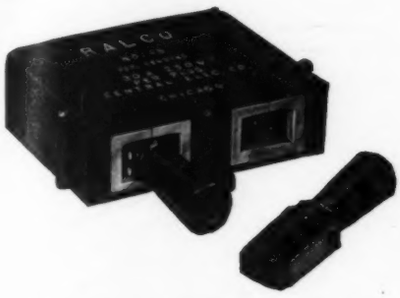
Central Electric Company · OKONITE · Chicago
THE HOUSE OF SERVICE

ALEXALITE
THE IDEAL INDIRECT UNIT

Diehl
TRADE MARK
FANS ARE STANDARD

# of Electrical Merchandising

ect lighting systems, a diffuser for indirect illumination, a plug and specialties (like the standard products of the House of Service) —and their prices are as low as is consistent with a reasonable profit.



RALCO PLUGS AND RECEPTACLES

are practically indestructible. They meet actual service necessities in diverse conditions with absolute satisfaction. They are especially desirable for use with portable machinery, vacuum cleaners, electric charging apparatus, elevators, stereopticans, moving picture machines and flood lighting systems. In many types—fused and fuseless—each designed for a specific class of service.

Send for bulletin and prices.

D & W FUSES

Give more fuse value than others because:

Links are scientifically designed.

They are riveted as well as soldered and cannot let go.

Blades are properly aligned and eliminate excessive heat.

DELTABESTON WIRE

For Armature and Field Coils. Heat that destroys cotton insulation has no injurious effect upon DELTABESTON

It is not affected by moisture.

Send for catalog and prices.

Okonite and Manson Tapes, Maxolites, Alexalites, G. E. and Diehl Fans, Ralco Plugs and Receptacles, Central Vacuum Cleaners, Universal Heating Devices, etc.

tric Company
Avenue, Chicago, Illinois

MONOLUX
DIRECT AND SEMI-INDIRECT LIGHTING UNITS

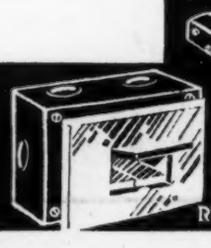
D&W
FUSES

COLUMBIA
DRY BATTERIES

GE
WIRING DEVICES

TRADE FARADAY MARK
BELLS AND BUZZERS

QUALITY PELOUZE
ELECTRIC HEATING DEVICES



RALCO PLUGS AND RECEPTACLES

Wallace

The Lamp of a Thousand Uses

Its merits heralded all over the country by a big national advertising campaign (you've seen our ads in the best mediums), the Wallace Portable has run away with the field and far outsold the combined sales of all other lamps of similar character.

The Wallace Portable Lamp Folded

A Wallace stands, hangs, clamps or sticks anywhere, in any position. It's as necessary, these days, in a traveler's bag as a tooth-brush. In the house it is splendid for use in the bath-room (it will cling to a mirror or a window pane), as a reading lamp, on a sewing machine, on the head piece of the bed, in the kitchen—wherever added light is needed.

Retails at $2.25

and the dealer's profit is very attractive. Unreserved guarantee—you may refund the purchase price in every case the lamp does not give satisfaction.

Write for Discount and Sample

Wallace Novelty Co., 19-25 E. 24th St., New York

These Booklets are just what you want for Your 1916 Requirements!

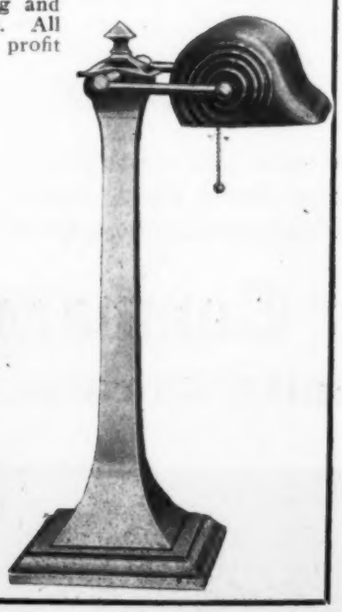
They Illustrate and Describe Hundreds of

FARIES FIXTURES

as well as the renowned Farieslite, the doubly-ventilated Type C Mazda Unit. Jobbers, contractors and central stations should lose no time in securing our illustrated catalog and bulletins describing our complete line. All Faries Fixtures are ready sellers and profit bringers.

ACT NOW—TODAY

Faries Mfg. Co.
Decatur, Ill.



White Porcelain Enamel Fixtures

Perfect Ventilation—
Very Attractive and Economical

No. 1

	List
16-in. Reflector	$5.00
18-in. Reflector	5.75

No. 6

	List
16-in. Reflector	$6.25
18-in. Reflector	7.00

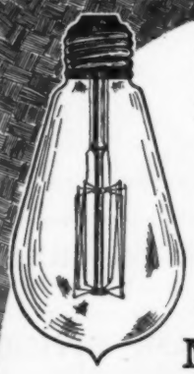
No. 9

	List
16-in. Reflector	$10.50
18-in. Reflector	11.25

No. 11

	List
6-in. Fitter	$5.50
8-in. Fitter	7.25

T. C. White Electrical Supply Co.
1122 Pine Street St. Louis, Mo.



Save money on tungsten lamp requirements by using the Made in U. S. A.

"KENTUCKY" DRAWN WIRE TUNGSTEN LAMPS

The prices will prove an agreeable surprise. Every lamp is guaranteed. Personal service goes with every order. No concern in the country is permicted to beat us on quick deliveries. Try a few "Kentucky" Tungstens. You'll agree they are better lamps for less money.

Write for prices

KENTUCKY ELECTRICAL CO., Inc.

Not connected with any other lamp concern

OWENSBORO, KY.

100% Profit

for the Month of January

A properly constructed semi-indirect fixture—pressed glass bowl diffuses all the rays evenly—soothing to the eye. As an introductory offer we will sell this handsome semi-indirect unit at far below our regular catalog price. (See page 35, Catalog No. 18.)

DURING JANUARY

$4

TO DEALERS

WIRED 40c EXTRA

Packing Charged at Cost

No. 2546E

Bowl, 16 in. Diam. Length, 36 in.

Designed by our own designer, this artistically molded bowl and graceful cast bowl-handle are exclusive with S. & A. The exclusive feature of this fixture makes it doubly valuable to you—for you can have no competition.

Order your "profit-maker" now. Make sure you have our catalog No. 18 handy. You will need it to show your customers.

We purposely made up this fixture in a larger quantity than usual in order to be able to offer a particularly attractive value for this month.

Take advantage of this opportunity. Order at least two, right now. Write for Catalog No. 18, to-day. Price holds good only for January.

Order now, and start the month right.

WRITE

SHAPIRO & ARONSON

21 Warren Street New York City

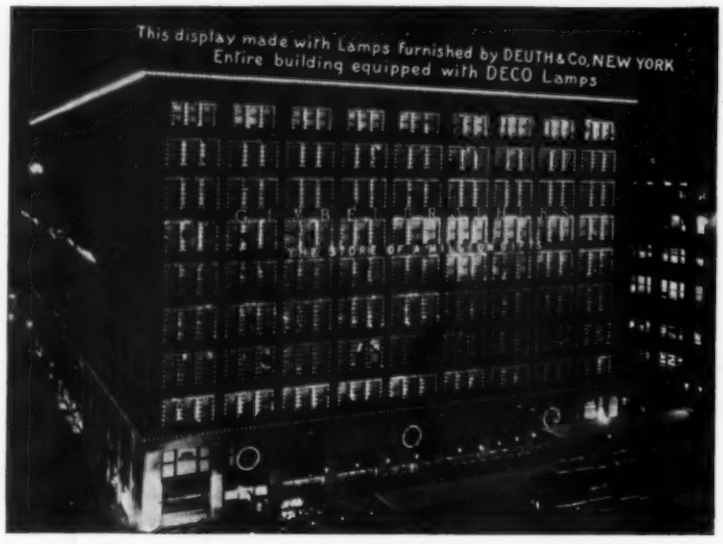
Deco Deco Deco Deco Deco Deco

THIS SPEAKS FOR ITSELF

Nitrogen
Tungsten
Carbon
Miniature
LAMPS

—

Imported
and
Domestic



Every
Lamp
Guaran-
teed

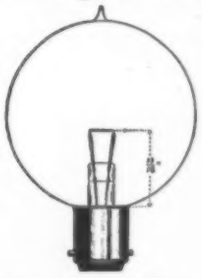
—

Our Lamps
Are Used
Every-
where

Write for special discounts — we charge only for brokerage

DEUTH & COMPANY Fifth National Bank Bldg. 131-133 E. 23rd Street **New York**

Nitrogen Filled Automobile Lamp



A Sensation

Drawn tungsten wire, helically wound, and the bulb filled with an inert gas! The most efficient miniature lamp made. Leading auto mfrs. use it on best cars. Largest dealers handle it. Biggest discounts—strong guarantee. We stand behind every lamp we make. Write for prices and discounts.

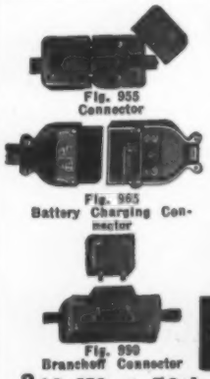
The A. C. Mannweiler Co. Fort Wayne Indiana

Lux Lamps

Nitros
40—1500 Watt
Concentrated Filament, Tungstens
Lux Mfg. Co.
Hoboken, N. J.

Best Grade Renewed Lamps

Both Carbon and Tungsten Types
We guarantee you most for the money
BOSTON-ECONOMY LAMP DIVISION
National Lamp Works of General Electric Co.
128 MAPLE STREET DANVERS, MASS.



Kliegl Connectors

for all theatrical and commercial purposes.

Approved N. B. F. U.
2 Wire 5 to 200 Amp., 110 Volts.
3 Wire 5 to 60 Amp., 250 Volts.

Connectors are provided on each end with an approved Cable Clamp, which has teeth which bite into the cable and hold the cable firmly by its outer insulation.

Universal Electric Stage Lighting Co.

Kliegl Bros.

240 West 50th Street NEW YORK

Bing!

Busted belt, half hour gone

Save that delay
Just a hammer to apply

Alligator Steel Belt Lacing

A smooth and lasting joint on any belt
Ask for free sample and prove it

Flexible Steel Lacing Co. 522 South Clinton Street Chicago

ANNOUNCEMENT

THE agreement under which the Holophane Works of General Electric Company has had the exclusive right of manufacture and sale of Holophane prismatic glass in the United States, expires on December 31st, 1915. This makes it necessary for the General Electric Company to discontinue the use of the name Holophane in the title of its selling organization which has handled this glassware.

¶ Therefore, on January 1st, 1916, the title Holophane Works of General Electric Company will be replaced by that of Ivanhoe-Regent Works of General Electric Company.

¶ All orders for Regent Glass and Ivanhoe metal reflectors will be handled at Cleveland, Ohio, by the same organization as before; and this organization will also offer for sale the Holophane prismatic line of glassware.

¶ The owners of the Holophane letters patent have established an office in New York City, but their organization should not be confused with the Ivanhoe-Regent Works.

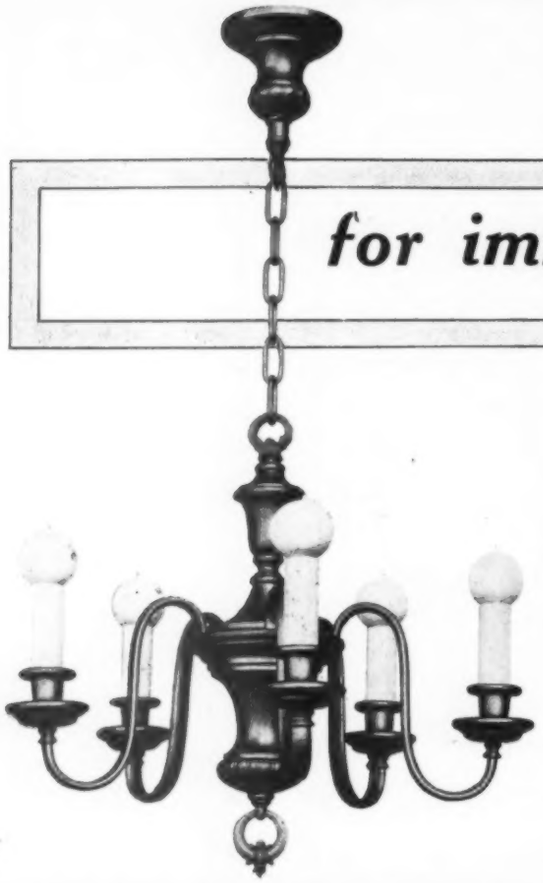
¶ The Ivanhoe-Regent Works respectfully solicits a continuation of your patronage on Holophane prismatic glass, as well as on the newer lines of Regent ornamental glass, and Ivanhoe metal reflectors.

IVANHOE-REGENT WORKS

of General Electric Company

CLEVELAND, OHIO

NEW YORK BOSTON PHILADELPHIA CHICAGO ST. LOUIS



In Catalog E 2

for immediate shipment

you will find listed, described and illustrated the

Edwards Line

of

Electric Fixtures, Brackets, Pendants, Combination Fixtures, Art Glass Domes, Electroliers and Portables.

Every design of proved selling merit—every number ready for shipment. Write for Catalog E 2.

Edwards Lighting Fixture Co.
Chicago

Write for it today

The "SUNDH"
Catalog of Electrical Controlling Devices

For Direct and Alternating Currents

You need it—and you'll find it mighty helpful

SUNDH ELECTRIC CO., New York

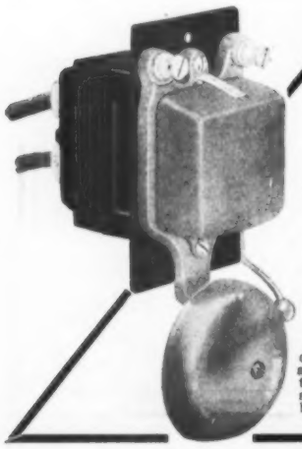
Chicago Office: H. J. Kaufman, Peoples Gas Building

Operated at a touch, but full of a tremendous capacity for hard work, describes

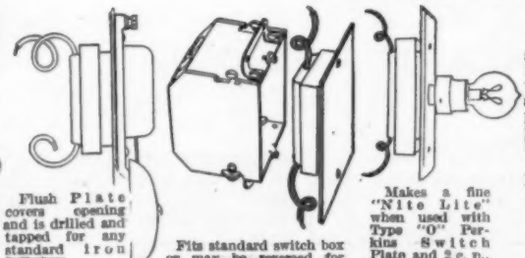
"CIRCLE T" Push Button Switches

Write for bulletin.

The Trumbull Electric Mfg. Company
Plainville, :: Connecticut



RITTENHOUSE Type "SB" BELL RINGING TRANSFORMER Makes Its Big Appeal Through Its Simplicity



Flush Plate covers opening and is drilled and tapped for any standard iron bell box.

Fits standard switch box or may be reversed for surface mounting.

Makes a fine "Nite Lite" when used with Type "O" Perkins Switch Plate and 2 c. p., 6 volt lamp.

Approved Lists at $2.50

Nothing like it made. It fits a standard single gang switch box, and the bell may be mounted on the transformer plate, which is drilled and tapped to take any standard bell. The result is the neatest possible job and secondary line trouble is practically eliminated, because the push-button loop is the only wiring necessary.

Ask for Bulletin—Order a sample. Money back if you say so.

The A. E. Rittenhouse Co.
Honeoye Falls, N. Y.

Pacific Coast Stock, Electric Agencies Co., 247 Minna St., San Francisco

The

CO-OPERATION

and

SERVICE

We render a customer make

BRYAN-MARSH MAZDA

A vital part of his business

Our central stations and agents have the unlimited use of our Illuminating Department in soliciting and securing new business. We prepare complete plans for lighting installations, without cost to the customer. No illumination problem is too large for this department to handle; no installation too small to receive careful attention.

We are firm believers in co-operative advertising work; and, with this idea in view, we keep constantly in touch with our customers, offering them live advertising matter in the way of window trims, newspaper cuts, lantern slides, folders, counter stands, metal signs for indoor and outdoor use, housewiring campaigns, and special features as they are developed.

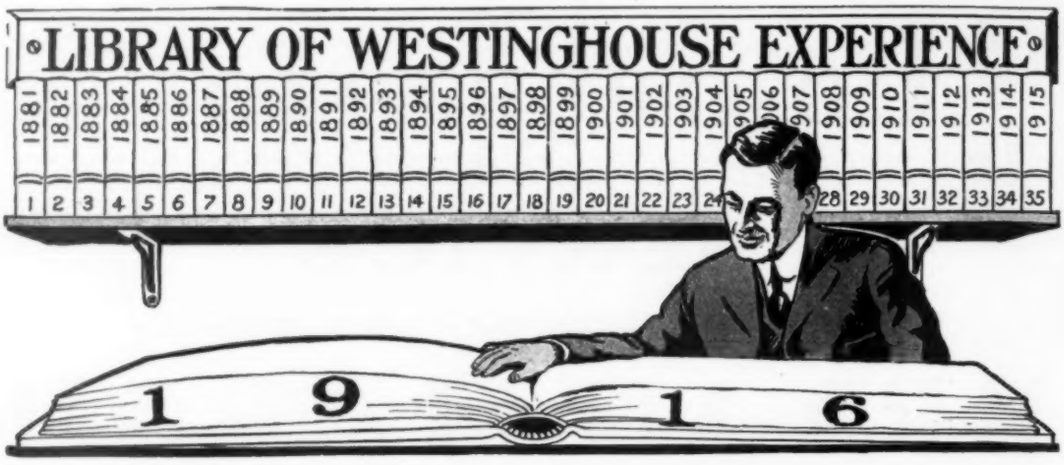
Our complete stocks, and numerous distributing centers throughout the country insure prompt shipment of orders.

BRYAN-MARSH DIVISION

National Lamp Works of General Electric Co.

CHICAGO, ILL. **CENTRAL FALLS, R. I.**

Minneapolis **Detroit** **New York** **Los Angeles** **Kansas City**
St. Louis **Denver** **Oakland** **New Orleans** **Seattle**



A LOOK INTO THE FUTURE

Now, at the beginning of the year, you are formulating ideas and planning campaigns to develop your business—to increase the value of your service.

From all indications, general conditions will be favorable for expansion. Results will follow energetic effort.

Your lamp business presents a wonderful opportunity, an opportunity we would like to help to take advantage of. For the coming year we can give you co-operation which will help you produce the results you want.

We offer you a product of superior quality, the result of thirty-five years of successful lamp making.

We offer service as perfect as we can make it.

We offer extensive advertising and selling help, more extensive even than that of the past.

We offer the benefit of our experience in lamp manufacture through educational literature.

We offer the personal work of our District Managers and Salesmen to increase the efficiency of **your** Salesmen in developing new business.

Finally we offer the name WESTINGHOUSE MAZDA which means prestige for those who handle Westinghouse Mazda Lamps.

You can easily take advantage of our help; a post card to us will bring you the facts. If you have had the benefit of Westinghouse Mazda Service in the past, you know that it represents something worth while.

"Guaranteed by the Name"

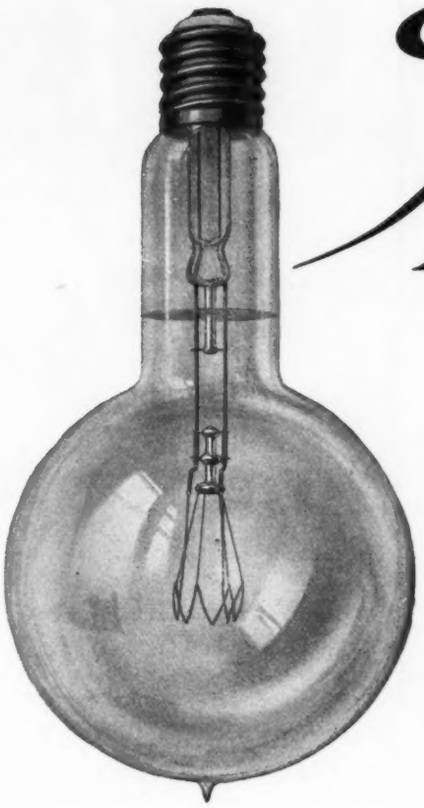
Westinghouse Lamp Company

Atlanta
Baltimore
Boston
Buffalo
Butte
Chicago
Cincinnati
Cleveland
*Dallas
Denver
Detroit
Kansas City

WESTINGHOUSE MAZDA LAMPS

Los Angeles
Milwaukee
New Orleans
New York
Philadelphia
Pittsburgh
Portland
St. Louis
Salt Lake City
San Francisco
Seattle
Syracuse

*Westinghouse Lamp Corporation.
Export Sales Dept.—165 Broadway, N. Y. C.
For Canada—Canadian Westinghouse Co., Limited, Hamilton, Ont.
Member Society for Electrical Development. Do It Electrically.



For a better Lamp Year

resolve to use

"NEW YORK"

Nitrogen Filled High Efficiency Lamps and

"REGENT"

Wire Drawn Tungstens

Our nitrogen filled high efficiency lamps represent the point of the most advanced development in the making of lighting units. 60 to 1,000 watts; immediate delivery; no hampering contracts; honest prices; full guarantee. Sold strictly on merit, these lamps are trade-winners.

"Regent" Wire Drawn Tungstens in all wattages can be had on rush orders in any quantities. Buy only the quantity you know you can sell—no trade agreements required before you handle "Regents." Order a trial case—it won't cost you a cent if you are not more than merely satisfied.

Write us for the most liberal dealer proposition ever offered

NEW YORK ELECTRIC LAMP CO.

Sales Dept.

38 Park Row New York City

Sales Agents Wanted

Central Station Dividends for 1916

will be greater if waste of labor, energy and material is reduced to the ultimate minimum. One necessary factor in operating efficiency and economy is the use of

A-W Series Mazda Regulators

Accomplish certain definite results:

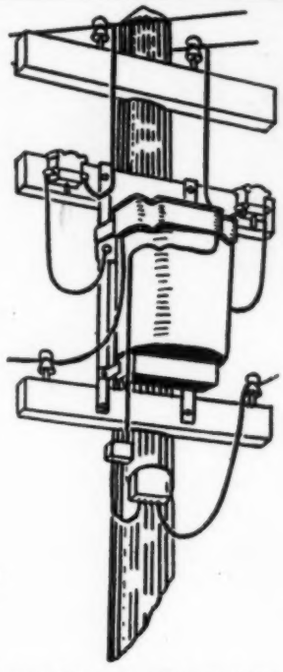
They prolong the life of expensive lamps—Vacuum Mazda and Mazda C Lamps.

They cut maintenance expense on series street lighting systems.

They maintain continuous good service because regulation is instantaneous.

A-W Series Control is the one sure and automatic method of guarding against loss of efficiency through under-voltage and ruptured filaments through over-voltage.

The A-W Mazda Regulator book should have a place in every central-station operator's library. Full of valuable information. Write for a copy today.



A-W Mazda Regulator
Pole Type

Mounted on a pole in the same manner as a central-station distributing transformer. Expressly designed to fill the demand for a unit regulator for feeding series burning vacuum or Type "C" Mazdas without requiring an attendant. "On" or "Off" control is usually obtained by means of a high-tension oil break and automatic time switch, requiring winding only once every eight days. Fool-proof and double-proof installation—a large number of middle west central stations are protecting their lamps by the A-W Regulator System.
Also made in Station Type.

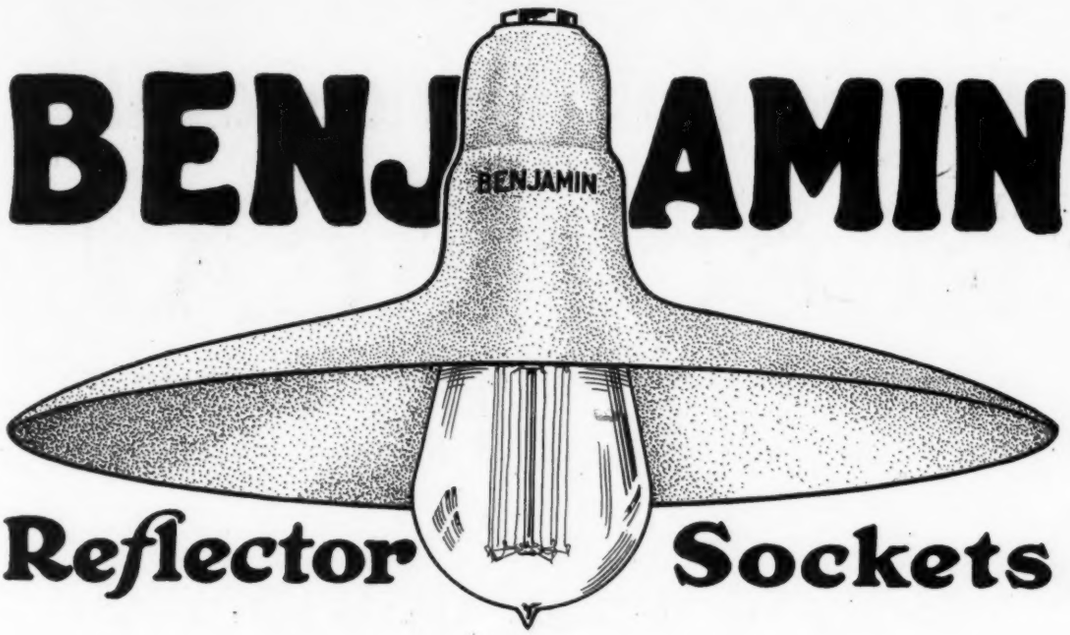
Electric Appliance Company

Chicago Dallas New Orleans San Francisco

Packard Electric Company

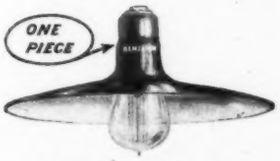
Warren, Ohio

BENJAMIN

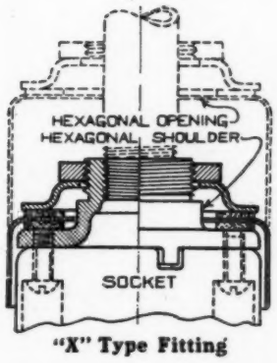


Reflector Sockets

Have Interchangeable "X" Type Fitting, Easy-to-Wire, Strong

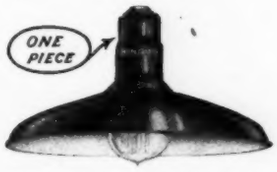


Flat Cone Reflector
Cat. No. X5402



"X" Type Fitting

Packed with Cardboard Covers in Shallow Boxes of Ten (10)



Shallow Bowl Reflector
Cat. No. X5423

A valuable new feature of Benjamin Reflector Sockets

brought out in our Catalog B-21 is found in what we call the "X" type, separable, easy-to-wire fittings. These fittings are made of malleable iron, machined, and fitted in our own factory, are interchangeable, thus assuring the perfect assembling of each and every fixture. Reflectors themselves have hexagonal opening through which the corresponding portion of the fitting projects sufficiently to permit the use of a wrench for tightening to the conduit. These fittings have a larger bearing surface than any other on the market, and are furnished with gaskets which will not deteriorate under changing atmospheric conditions. Then, too—

NOTE: All reflectors are carefully nested in standard packages of 10 each. Special containers with cardboard cones between reflectors make it possible to assemble otherwise bulky shipments in a very limited area. **This makes it possible for the dealer to carry a representative stock with a minimum amount of room, etc., etc.**

For Good Results Use "Benjamin" Reflector Sockets

BENJAMIN ELECTRIC MFG. CO.

120-128 S. Sangamon St.

NEW YORK 114 Liberty St. CHICAGO SAN FRANCISCO 590 Howard St.

TORONTO LONDON, ENG.

The Seventh Edition of the

ELECTRICAL BLUE BOOK

is now being distributed

All subscribers who paid delivery charges will receive their copies during the present month

A limited edition is for sale at $2.00 per copy

Address

ELECTRICAL BLUE BOOK DEPARTMENT
Electrical Review and Western Electrician
608 South Dearborn Street
Chicago

WE TAKE this opportunity to express our appreciation for the business which central stations, dealers and contractors have placed with us during 1915.

At the beginning of another year we look forward to the opportunity to serve the industry in such a way as to merit a continuation of, and an increase in, its valued patronage.

Western Electric Company

New York	Atlanta	Chicago	Kansas City	San Francisco
Buffalo	Richmond	Milwaukee	Omaha	Oakland
Philadelphia	Savannah	Indianapolis	Oklahoma City	Los Angeles
Boston	New Orleans	Cleveland	Minneapolis	Seattle
Pittsburgh	Houston	Cincinnati	St. Paul	Portland

St. Louis Dallas Denver Salt Lake City

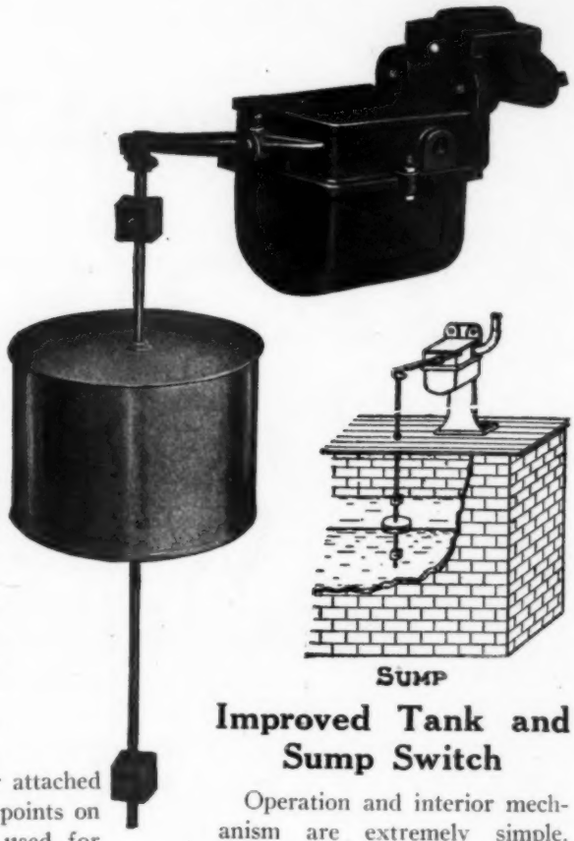
EQUIPMENT FOR EVERY ELECTRICAL NEED

Member Society for Electrical Development. "Do it Electrically"

SUNDH
controlling devices

Gauge Type Regulator

Gives the most satisfactory means of controlling pressure in tanks, reservoirs, etc., by starting and stopping motor-driven apparatus. The construction consists of a silver-tipped contact lever attached to the tube and moving between two silver contact points on pressure fluctuations. The screw on the right is used for adjusting to maximum pressure desired and the lower screw on left hand is for adjusting for difference in pressure. It can be set to operate on a pressure difference of about three to five per cent. A wider range may be obtained by screwing down the left-hand screw. Fully explained in Sundh catalog.



SUMP

Improved Tank and Sump Switch

Operation and interior mechanism are extremely simple. Unequaled for controlling the water level in tanks, wells or pumps. The switch is weatherproof and can be made water tight if required. The Sundh Improved Tank and Pump Switch is fully described in catalog.

Solenoid Motor Starter

One particularly important feature is the absence of sliding contacts. Thus the usual trouble due to arcing and consequent sticking of the moving members is avoided. This motor starter is compact and simple. All wearing parts may easily be replaced. Construction and operation given in catalog.

SOLENOID MOTOR STARTER

We also furnish the following standard devices:

Fire Pump Panel
Elevator Controllers
Circuit Breakers
Remote Control Switches
Liquid Level Indicator
Lighting Panels
Valve Control
Speed Regulator
Hand Starters
Switches—Automatic and Hand
Automatic Starter for A. C. and D. C.

An interesting catalog fully descriptive of Sundh Controlling Devices sent on request. You'll find it helpful.

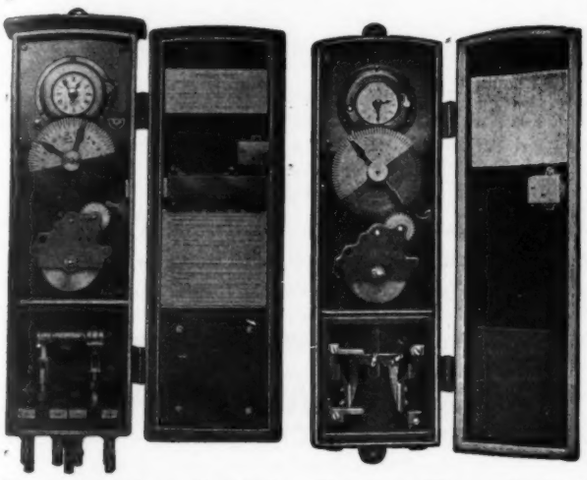
Sundh Electric Company
New York

Chicago Office, H. J. Kaufman, Peoples Gas Building

Our most hearty wishes for a prosperous New Year are extended to the electrical dealers and contractors of the country.

1916 will offer many opportunities for the profitable sale and installation of

ANDERSON Automatic Time Switches



Type K Time Switch

Double Pole, Double Branch, for Potentials not Exceeding 250 Volts, A. C. or D. C.

This switch is designed to close one circuit before the other and open both at the same time, or to close both circuits at the same time and open at different times.

Type F Time Switch

Double Pole, Single Throw for 250 Volts D. C. or A. C.

Operating mechanism is positive and absolutely dependable under all conditions. Will switch circuits on or off at any predetermined time. No attention other than winding once a week is necessary. This time switch may be equipped with Sunday or Holiday Cut-Out Attachment, or Saturday Time Extension Device.

Anderson Time Switches will take care of any "on" or "off" combination. Write for Bulletin 33

ALBERT & J. M. ANDERSON MFG. CO.
(Established 1877)
289-293 A St., Boston, Mass., U. S. A.

Branches
NEW YORK, 135 Broadway Chicago, 105 S. Dearborn St.
PHILADELPHIA
429 Real Estate Trust Bldg.
SAN FRANCISCO
613 Postal Telegraph Bldg.
LONDON
48 Milton Street, E. C.

Policy and Performance

THE Roller-Smith Company has back of it an experience extending over a period of twenty years. The results of that experience are incorporated in every device which bears its name. To this we add the most careful selection of materials, workmanship of the highest order and exacting calibration and inspection.

We do not market our apparatus indiscriminately with the idea of selling a customer as much as he will buy. Every member of our sales organization works on the principle that our interests are best served if the customer is sold only what he needs and what is best suited to his needs.

Our responsibility and interest do not cease with the sale. We stand back of every device we sell, not only for a year, but for all time, and our keen desire is that every user of our products shall be not only a satisfied user but a friend.

The rapid growth of this Company attests the inherent soundness of its policies.

Roller-Smith Co.
203 Broadway New York

Manufacturers of Electrical Measuring and Protective Apparatus

Counts 13 Million Parts a Year

On ONE

NATIONAL COUNTING and WEIGHING MACHINE

The Manufacturer of a well known spark plug made this statement. He says:

"We receive, assemble and dispose of thirteen million parts per annum. All of these are counted on your machine, put in our stock room and are recounted when taken out of our stock room on Shop Orders. With the assistance of this machine we are able to do without any stock clerk or any extra man, which means that we save the salary of these men.

"If we had to count these pieces by hand, we could not turn out the number of units we do. We find the machine very accurate and most satisfactory in every respect."

Thousands of Manufacturers are saving money and eliminating counting troubles with the National Counting Machine. Let us tell you who they are—also send you Illustrated Catalogue R.

NATIONAL SCALE COMPANY

36 Montgomery Street Chicopee Falls, Mass.

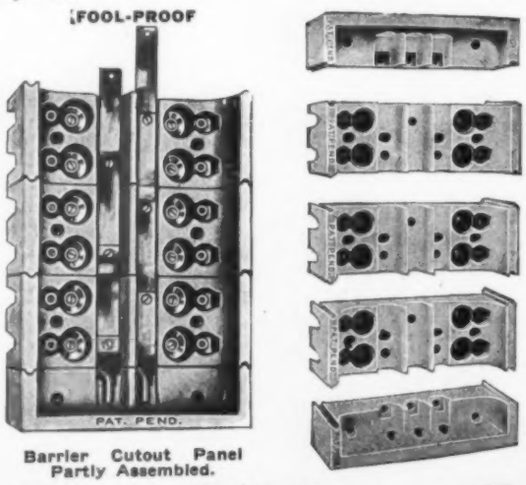
Manufacturers of National-Chapman Elevating Trucks

The Panel Board Problem Solved by

C & P "BARRIER" CUTOUTS

When placed side by side they form any size Panel Board required, with a barrier all the way around for a wiring gutter. No slate or steel sides with bushings required. Neat and attractive in appearance. Save time, labor and expense.

FOOL-PROOF



Barrier Cutout Panel Partly Assembled.

Manufactured by

C. & P. Electric Works

Springfield, Mass.

BELDEN MAGNET WIRE

"BELDENAMEL"

Standard Insulation for Enameled Wire

"SILKENAMEL" "COTENAMEL"

Other Insulations

The high standard of Belden Magnet Wire is the result of thirteen years' experience and the expenditure of thousands of dollars in the development and perfection of machines and processes. Out of this experience has grown "Belden Quality and Belden Service" which have established new standards in the Electrical business. Our large complete stock of all standard sizes and insulation is available to you.

We manufacture a complete line of Electrical Wires, Cables and Cordage. For list see our Catalog No. 6.

BELDEN MANUFACTURING COMPANY

2304 S. Western Ave. C. 5. **Chicago, Ill.**

Trouble Men's Attention

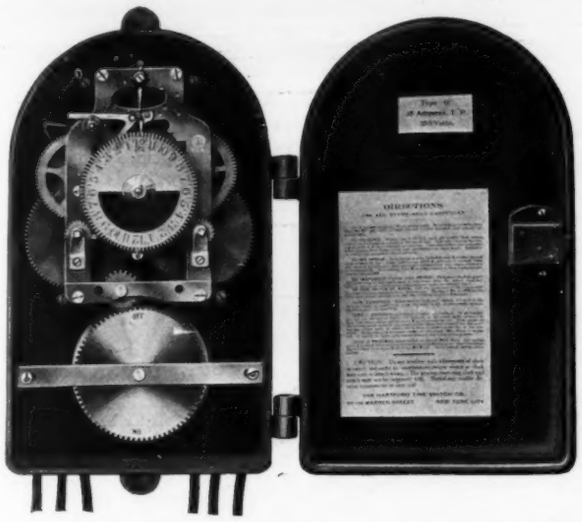
The Brilliant Search Light is just the light to locate trouble, no matter how stormy or dark the night. Being worn on the head it puts a bright light wherever you look, leaving hands free to perform all duties on the poles or in the ground.

These lamps are used by some of the leading Electric Light and Power Companies, in high tension lines.

Style 1—Single lens, $5.00. Double Lens, $6.00. Int. Lens, $6.50.
Style 2—Adjustable Candle Flame Burner, add 50c.
Style 3—Adjustable Flat Flame Burner, add $1.00.

Send for Circular

R. C. KRUSCHKE, H 1403 Superior St., Duluth, Minn.



IF it's a **HARTFORD**

It's a RELIABLE TIME SWITCH

Once in circuit with a "HARTFORD," window signs or other lighting will take care of itself perfectly.

Trouble Proof—Dust Proof—Weather Proof

TYPE B—On and Off Daily
TYPE C—On and Off Daily, Omits Sunday
TYPE D—On and Off Twice Daily
TYPE E—Two Rate Meter Service
TYPE G—Apartment House Service Night Light Control

Just wind it once a week—that's all

HARTFORD TIME SWITCH CO.

A. HALL BERRY, Gen. Sales Agt. *Northern Electric Company* LIMITED Canadian Representative

Service That Pays Its Own Way

Loxon Lamp Guards give service of this kind because they prevent lamp breakage and the unauthorized removal of Lamps.

Loxon Lamp Guards are sold by the leading Electrical Dealers.

McGILL MFG. CO.

26 Oak Street Valparaiso, Ind.

Clean Cylinders of Carbon Deposit

at Trifling Cost with EVER-READY
GUARANTEED
CARBON REMOVER AND ENGINE CLEANER

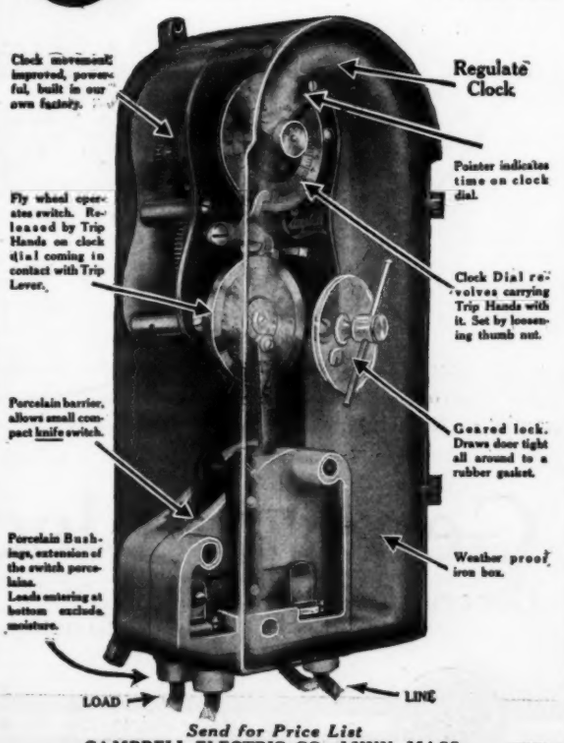
Gasoline engine cylinders filthy with carbon deposit are cleaned in a few minutes with an application of "Ever-Ready." It is a liquid which cuts the asphaltum in carbon and precipitates it as a black powder, which is blown from the exhaust as the motor is started. "Ever-Ready" is non-injurious to metals or human flesh. Unlimited guarantee. Money refunded if dissatisfied. Every one of your customers using a stationary gas engine or an automobile is a prospective customer.

Write at once for prices and dealers' proposition

EVER-READY MFG. CO. 4061 Easton Avenue' ST. LOUIS, MO.

CAMPBELL TIME SWITCH

THE BEST **PATENTED**


Clock movement improved, powerful, built in our own factory.
Regulate Clock
Pointer indicates time on clock dial.
Fly wheel operates switch. Released by Trip Hands on clock dial coming to contact with Trip Lever.
Clock Dial revolves carrying Trip Hands with it. Set by loosening thumb nut.
Porcelain barrier, allows small compact knife switch.
Geared lock. Draws door tight all around to a rubber gasket.
Porcelain Bushings, extension of the switch porcelains. Leads entering at bottom exclude moisture.
Weather proof iron box.
LOAD
LINE

Send for Price List

CAMPBELL ELECTRIC CO., LYNN, MASS.

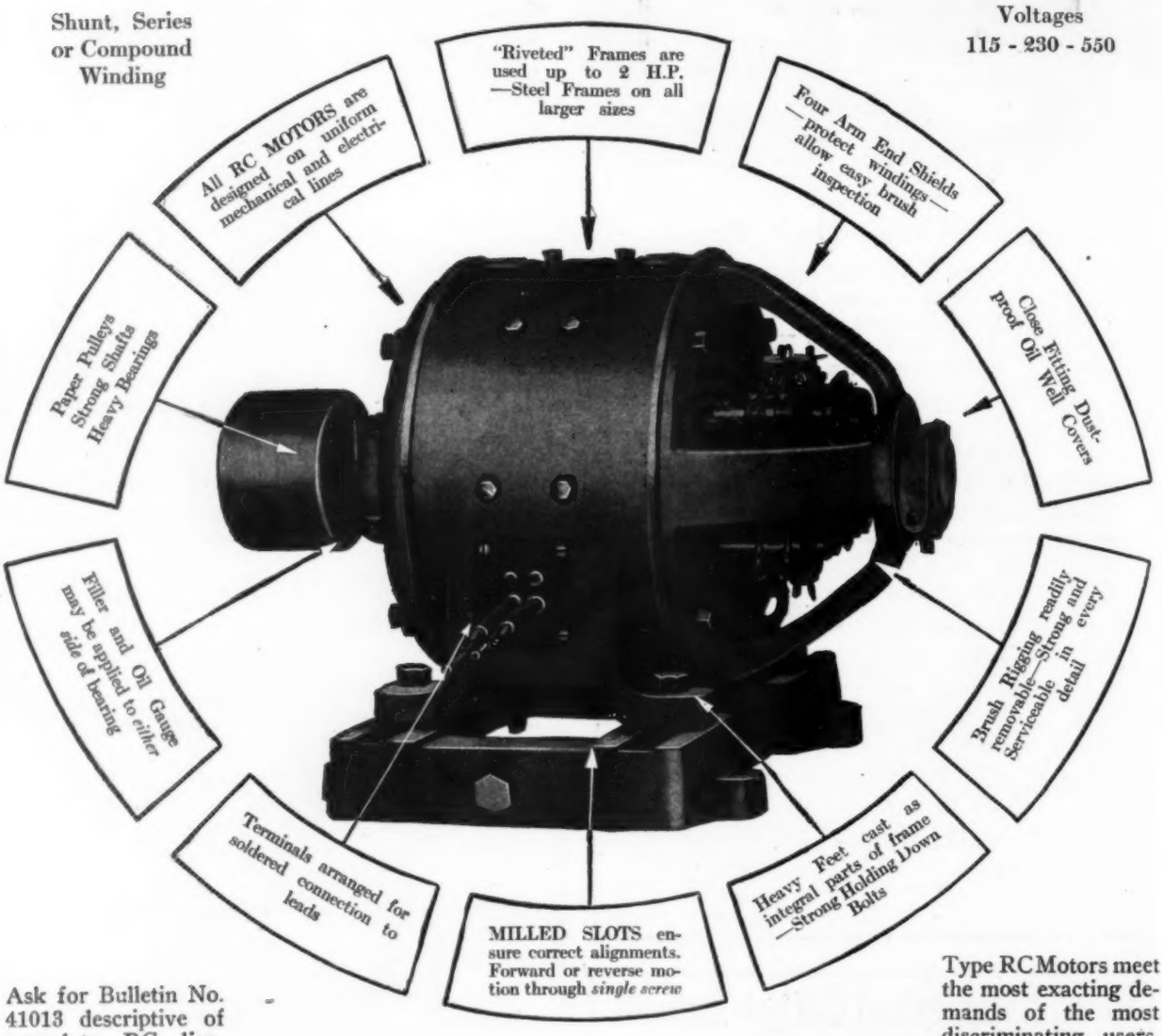
This Trade Mark The Guarantee of Excellence on Goods Electrical.

Direct Current Motors Type RC Commutating Pole

Capacities 1/2 to 75 Horse Power

Shunt, Series or Compound Winding

Voltages 115 - 230 - 550


"Riveted" Frames are used up to 2 H.P. —Steel Frames on all larger sizes
All RC MOTORS are designed on uniform mechanical and electrical lines
Four Arm End Shields protect windings— allow easy brush inspection
Close Fitting Dust-proof Oil Well Covers
Paper Pulleys Strong Shafts Heavy Bearings
Brush Rigging readily removable—Strong and Serviceable in every detail
Filler and Oil Gauge may be applied to either side of bearing
Heavy Feet cast as integral parts of frame —Strong Holding Down Bolts
Terminals arranged for soldered connection to leads
MILLED SLOTS ensure correct alignments. Forward or reverse motion through single screw

Ask for Bulletin No. 41013 descriptive of complete RC line.

Type RC Motors meet the most exacting demands of the most discriminating users.

General Electric Company

General Office Schenectady, N. Y.

List of Sales Offices on Second Page Before Editorial

5865

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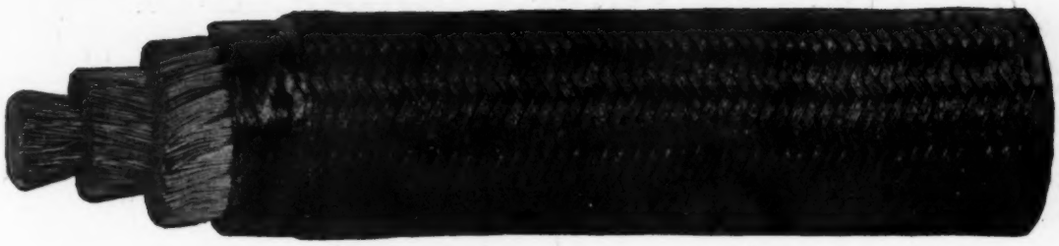


640,000 Circ. Mil. extra flexible cable, exact size

Extra-flexible apparatus cable carried in stock

The General Electric Company carries in stock extra flexible cable with varnished cambric insulation in sizes listed below. This cable is specially adapted for brush-holder and transformer leads, or for any use where great flexibility is required and where the potential does not exceed 750 volts.

The standard finish is a single glazed cotton braid, but cable finished with weatherproofed braid can be supplied on order.

Number of No. 24 B. & S. Wires in Strand	Actual Circular Mils	Dimensions in Inches		
		Diam. Bare	Thickness of V. C.	Diameter Over All
19	7600	0.100	3/64	0.250
37	14800	0.140	3/64	0.300
61	24400	0.180	1/16	0.370
91	36400	0.220	1/16	0.405
125	50000	0.300	1/16	0.445
150	60000	0.325	5/64	0.565
175	70000	0.350	5/64	0.590
225	90000	0.390	5/64	0.630
275	110000	0.420	5/64	0.660
325	130000	0.460	5/64	0.700
375	150000	0.500	5/64	0.740
450	180000	0.540	5/64	0.800
550	220000	0.590	5/64	0.850
650	260000	0.660	3/32	0.975
775	310000	0.740	3/32	1.035
925	370000	0.790	3/32	1.050
1100	440000	0.910	3/32	1.190
1325	530000	0.970	7/64	1.275
1600	640000	1.060	7/64	1.370
1925	770000	1.120	7/64	1.430
2300	920000	1.230	7/64	1.540
2750	1100000	1.370	7/64	1.675
3300	1320000	1.500	7/64	1.805

In addition to manufacturing all standard insulated wires and cables, the General Electric Company makes a specialty of the following: Asbestos cable for station work, N. I. wires and cables, flame-proof wire used for wiring rheostats, and ignition, lighting, and starter cables for automobiles furnished with or without armor.

General Electric Company

List of Sales Offices on Second Page Before Editorial Section

5910

This Trade Mark The Guarantee of Excellence on Goods Electrical.

This Trade Mark The Guarantee of Excellence on Goods Electrical.

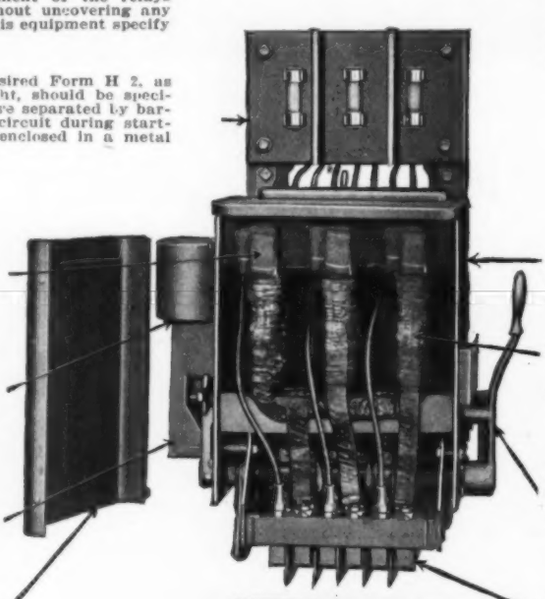
The CR 1034 Compensator

For Squirrel Cage Induction Motors

Overload Relays afford excellent protection to the motor. Used in place of fuses they soon pay for themselves by eliminating fuse bills and by preventing the cause of 90 per cent of all motor burnouts, i. e., single-phase running. Adjustment of the relays can be made without uncovering any live parts. For this equipment specify form H 2.

If fuses are desired Form H 2, as shown at the right, should be specified. The fuses are separated by barriers, are not in circuit during starting, and can be enclosed in a metal case if desired.

A Conduit Wiring Case simplifies the wiring and contributes greatly to the neatness of the installation. For this equipment specify Form H 5.



Taps are brought out from each coil to give 50, 65 or 80 per cent of line voltage in starting motors 18 horse power and below and 60, 58, 70 or 85 per cent for larger motors.

The Low Voltage Release saves fuses and protects the operator by preventing restarting of the motor after failure of voltage. This release throws the handle to the "Off" position when power fails. Push buttons connected in this circuit will provide **"Emergency Stop."**

All Parts of the low voltage release, coils and mechanism, are enclosed preventing mechanical injury.

The Cover is removable for inspection or changing of the tap connections. Complete instructions for installing and operating placed inside the cover.

Frames are either pressed steel or cast iron depending on the size. The first four sizes are arranged for mounting on the wall, while all others are for mounting on the floor.

Impregnation of Coils under vacuum makes them moisture-proof, increases insulation, improves radiation, and adds mechanical strength. Coils are rigidly supported in the frame.

The Handle must be thrown all the way to the starting position before it can be thrown to the running position. **A Locking Device** can be supplied so that the handle can be locked in the "Off" position.

The Switch has heavy wiping contacts and all arcing is confined to the tips and takes place under oil. The wiping action keeps them bright and smooth.

The Oil Tank when removed exposes the switch parts for inspection or repairs without disturbing other parts.

The Ammeter mounted on the same panel as the overload relays is an additional insurance against seriously overloading the motor. Specify Form H 4.

Made in all sizes

From 5 to 250 Horsepower

All standard voltages and frequencies for either two or three phase circuits.

Simplicity of Operation with all live or moving parts enclosed tends toward the elimination of accidents. Specify Form H 13.

For small A. C. motors, investigate the CR 1031 switch, built in the same case as the 1034 but without compensator coils. Ask our nearest office for complete information.

General Electric Company

List of Sales Offices on Second Page Before Editorial Section

5896

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This Trade Mark The Guarantee of Excellence on Goods Electrical.

Sales Offices of the General Electric Company

This page is prepared for the ready reference of the readers of the Electrical Review and Western Electrician. To insure correspondence against avoidable delay, all communications to the Company should be addressed to the sales office nearest the writer.

ATLANTA, GA., Third National Bank Building.
BALTIMORE, MD., Munsey Bldg.
BIRMINGHAM, ALA., Brown-Marx Building.
BOSTON, MASS., 84 State Street.
BUFFALO, N. Y., Electric Building.
BUTTE, MONTANA, Electric Building.
CHARLESTON, W. VA., Charleston National Bank Building.
CHARLOTTE, N. C., Commercial National Bank Building.
CHATTANOOGA, TENN., James Building.
CHICAGO, ILL., Monadnock Building.
CINCINNATI, OHIO, Provident Bank Building.
CLEVELAND, OHIO, Illuminating Building.
COLUMBUS, OHIO, Columbus Savings & Trust Building.
DAYTON, OHIO, Schwind Building.
DENVER, COLO., First National Bank Building.
DES MOINES, IOWA, Hippee Building.
DULUTH, MINN., Fidelity Bldg.
ELMIRA, N. Y., Hulett Building.
ERIE, PA., Marine National Bank Building.
FORT WAYNE, IND., Fort Wayne Electric Works.
HARTFORD, CONN., Hartford National Bank Building.
INDIANAPOLIS, IND., Traction Terminal Building.
JACKSONVILLE, FLA., Heard National Bank Building.
JOPLIN, MO., Miners' Bank Building.
KANSAS CITY, MO., Dwight Building.
KNOXVILLE, TENN., Bank & Trust Building.
LOS ANGELES, CAL., 724 South Spring Street.
LOUISVILLE, KY., Starks Building.
MEMPHIS, TENN., Randolph Building.
MILWAUKEE, WIS., Public Service Building.
MINNEAPOLIS, MINN., 410 Third Ave., North
NASHVILLE, TENN., Stahlman Building.
NEW HAVEN, CONN., Second National Bank Building.
NEW ORLEANS, LA., Maison-Blanche Building.
NEW YORK, N. Y., Hudson Terminal Building.
NIAGARA FALLS, N. Y., Gluck Building.
OMAHA, NEB., Union Pacific Building.
PHILADELPHIA, PA., Witherspoon Building.
PITTSBURG, PA., Oliver Building.
PORTLAND, ORE., Electric Building.
PROVIDENCE, R. I., 1012 Turks Head Building.
RICHMOND, VA., Virginia Railway and Power Building.
ROCHESTER, N. Y., Granite Building.
SALT LAKE CITY, UTAH, Newhouse Building.
SAN FRANCISCO, CAL., Rialto Building.
SCHENECTADY, N. Y., G-E Works.
SEATTLE, WASH., Colman Building.
SPOKANE, WASH., Paulsen Building.
SPRINGFIELD, MASS., Massachusetts Mutual Building.
ST. LOUIS, MO., Pierce Building.
SYRACUSE, N. Y., Onondaga County Savings Bank Building.
TOLEDO, OHIO, Spitzer Building.
WASHINGTON, D. C., Evans Building.
YOUNGSTOWN, OHIO, Wick Building.

For MICHIGAN business refer to
GENERAL ELECTRIC COMPANY OF MICHIGAN.
Detroit, Mich. Dime Savings Bank Bldg.
For TEXAS, OKLAHOMA and ARIZONA business refer to
SOUTHWEST GENERAL ELECTRIC COMPANY.
(Formerly Hobson Electric Co.)
DALLAS, TEXAS, 1701 No. Market St.
HOUSTON, TEXAS, 3rd and Washington Streets.
EL PASO, TEXAS, 500 San Francisco Street.
OKLAHOMA CITY, OKLA., Insurance Building.
For HAWAIIAN business address
CATTON NEILL & COMPANY, Ltd., Honolulu.
For all CANADIAN business refer to
CANADIAN GENERAL ELECTRIC CO., Ltd., Toronto, Ont.
For business in GREAT BRITAIN refer to
BRITISH THOMSON-HOUSTON CO., Ltd., Rugby, Eng.

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General Electric Company

General Office: Schenectady, N. Y.

Member of the Society for Electrical Development, Inc.
"DO IT ELECTRICALLY"

3389

This Trade Mark The Guarantee of Excellence on Goods Electrical.

The New

Weston

Portable Testing Instruments

A. C. and D. C. Electrodynamometer Voltmeter, Model 341

An instrument of Precision guaranteed to an accuracy of ¼ of 1% of full scale value on the working part of the scale, whether used on D. C. circuits or A. C. circuits of any frequency up to 133 cycles per second and on circuits of any wave form. Double ranges are furnished in this model.

The movable system has an extremely low moment of inertia and is very effectively damped. Indicators are independent of room temperature and the instrument is shielded from external magnetic fields. The scale, 5¼ inches long, is hand-calibrated and uniform throughout the upper four-fifths portion. It is provided with a mirror over which the knife-edge pointer travels, and the pointer may easily be adjusted to zero by means of a zero correcting device.

For complete information regarding Model 341 write for Bulletin No. 2004. Other models in this group are Model 370 A. C. and D. C. Portable Ammeter, described in Bulletin No. 2003; Model 310 Single-Phase and Direct Current Portable Wattmeter, and Model 329 Portable Polyphase Wattmeter, both described in Bulletin No. 2002.

Weston Electrical Instrument Co.
19 Weston Ave., Newark, N. J.

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Buyers' Guide of Electrical Material

Published in First Issue of Each Month

The co-operation of manufacturers and buyers of electrical material is earnestly requested to make this list comprehensive and authentic. Suggestions for its improvement, and information respecting corrections or omissions will be gratefully received. For announcements of manufacturers whose names are printed in bold-face type refer to the Alphabetical Index of advertisers in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

ABSORBERS, Shock.
Benjamin Elec. Mfg. Co., Chicago, Ill.

ACCUMULATORS.
See Batteries, Storage.

ADAPTERS, Automobile (Oil Lamp Converters.)
Metal Specialties Mfg. Co., Chicago, Ill.
Apple Elec. Co., Dayton, Ohio.
Beckley-Ralston Co., Chicago, Ill.
Black Mfg. Co., Fort Wayne, Ind.
Campbell Co., A. S., Boston, Mass. "Cello"
Chicago Elec. Mfg. Co., Chicago, Ill. "Handy".
Dietz Co., R. E., New York, N.Y.
Fowler Lamp & Mfg. Co., Chicago, Ill.
Garage Equip. Mfg. Co., Milwaukee, Wis. "Lightning".
Gray & Davis, Amesbury, Mass.
Howard Miniature Lamp Co., Newark, N. J. "Snap-on".
Frank W. Morse, Boston, Mass.
Standard Electric Novelty Co., Chicago, Ill.

ADAPTERS, Lamp. (Tungsten Adapters, Socket Adapters, Adjustable Joints.)
Arrow Electric Co., Hartford, Conn.
Benjamin Elec. Mfg. Co., Chicago, Ill. (Tungsten Adapters.)
Faries Mfg. Co., Decatur, Ill.
Federal Sign System (Electric), Chicago, Ill.
General Electric Co., Schenectady, N. Y. "G. E."
Hubbell, Harvey, Inc., Bridgeport, Conn.
Bryant Electric Co., Bridgeport, Conn.

ADJUSTERS, Cord and Lamp. (Spring and Roller Devices for raising and lowering Incandescent Lamps.)
Franks Mfg. Co., Rock Island, Ill.
McGill Mfg. Co., Valparaiso, Ind. "Innovate."
Trumbull Electric Mfg. Co., Plainville, Conn. "Ideal".
Western Electric Co., New York.
Allan, Stansfield & Allan, Cranford, N. J.
Cohn, Adolph, West Hoboken, N. J.
Gammache, F. J., Lancaster, Pa.
Gam Mfg. Co., Lancaster, Pa. "Gam."
Hagstrom Bros. Mfg. Co., Lindsborgh, Kans. "Hagstrom".
B. C. Milam & Son, Frankfort, Ky.
Frank W. Morse, Boston, Mass.
Novelty Turning Co., Norway, Maine.
Frank H. Stewart Electric Co., Philadelphia, Pa.
Union Electric Mfg. Co., Milwaukee, Wis. "Gem".

ADJUSTERS, Socket Chain.
See Attachments, Socket.

AIR BRUSHES.
See Brushes, Pneumatic.

AIR COMPRESSORS, Motor Driven (For small sizes, see Brushes.)
Allis - Chalmers Manufacturing Co., Milwaukee, Wis.
Emerson Electric Mfg. Co., St. Louis, Mo.
Fairbanks, Morse & Co., Chicago.
General Electric Co., Schenectady.

ALARMS, Burglar.
See Burglar Alarms.

ALARMS, Fire.
See Fire Alarms.

ALARMS, Tank.
See Tank Alarms.

ALTERNATORS.
See also Motors and Dynamos.
Allis - Chalmers Manufacturing Co., Milwaukee, Wis.
Crocker-Wheeler Co., Ampere, N. J.
Electric Machinery Co., Minneapolis, Minn.
Fairbanks, Morse & Co., Chicago.
Fort Wayne Electric Works, Fort Wayne, Ind.
General Electric Co., Schenectady, N. Y.
Triumph Electric Co., Cincinnati.
Wagner Electric Mfg. Co., St. Louis.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

ALUMINUM.
Aluminum Co. of America, New Kensington, Pa.
British Aluminum Co., Toronto, Ont.
U. S. Aluminum Co., Pittsburgh.

AMMETERS AND VOLTMETERS.
See also Battery Gauges.
Badt-Westbury Electric Co., Inc., Chicago.
Bristol Company, Waterbury, Conn.
Esterline Co., The, Indianapolis.
General Electric Co., Schenectady.
Hoyt Electrical Instrument Wks., Penacook, N. H.
Metropolitan Engineering Co., New York City.
Roller-Smith Co., New York.
Thompson-Levering Co., Philadelphia, Pa. "Peerless."
Wagner Electric Mfg. Co., St. Louis.
Western Electric Co., New York.
Weston Electrical Instrument Co., Newark, N. J. "Weston" Alternating and Direct Current.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
James G. Biddle, Philadelphia, Pa.
L. S. Brach Supply Co., New York, N. Y.
Conn. Telephone & Electric Co., Meriden, Conn. (Battery Current Indicators.)
Dongan Electric Mfg. Co., Detroit, Mich.
Eldredge Mfg. Co., Springfield, Mass. (Advance lamp tester.)
W. & L. E. Gurley, Troy, N. Y. "Friendly".
Hoskins Mfg. Co., Detroit, Mich.
Jewell Electrical Instrument Co., Chicago.
Keystone Electrical Instrument Co., Philadelphia, Pa.
Mohawk Electric Mfg. Co., Newark, N. J. (Hot Wire.)
Louis M. Pignolet, New York.
Queen-Gray Co., Philadelphia, Pa.
Reliance Instrument Co., Chicago.
Robert Instrument Co., Detroit. (Portable and "Tungsten Selling".)

ANCHORS, Guy.
Barnes & Kobert Mfg. Co., New Haven, Conn.
Central Electric Co., Chicago, Ill.
H. W. Johns-Manville Co., New York. N. Y. "J. M."
Ohio Brass Co., Mansfield, Ohio.
Oshkosh Mfg. Co., Oshkosh, Wis.
Universal Cable Grip Co., Syracuse, N. Y. (Driven) "Universal."
Western Electric Co., New York, N. Y. "D. & T." "Matthews."
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Crouse-Hinds Co., Syracuse, N. Y. "Harpoon".
Mathew Lanz & Sons, Pittsburgh, Pa.
W. N. Matthews & Bro., St. Louis, Mo. "Matthews".

ANCHORS, Screw. See Expansion Bolts. Toggle Bolts.

ANNUNCIATORS. Elevator, Hotel and Burglar Alarm.
Central Electric Co., Chicago, Ill.
Manhattan Electrical Supply Co., New York, N. Y.
W. R. Ostrander & Co., New York.
Stanley & Patterson, New York. "Premier".
Western Electric Co., New York. "Hawthorn".
Ansonia Electrical Co., Ansonia, Conn.
Automatic Appliance Co., Boston, Mass.
Connecticut Telephone & Elec. Co., Meriden, Conn.
De Veau Telephone Mfg. Co. Brooklyn, N. Y. "Auth."
Edwards & Co., New York. "Eco". "Cadet", "Dixie", "Shallow Type".
Electric Goods Mfg. Co., Canton, Mass. "Rival", "Hub", "Ross", "Dandy", "Perfect", "Nexall".
Holtzer - Cabot Electric Co., Brookline, Mass.
Francis Kell & Son, New York.
Knickerbocker Annunciator Co., New York.
Menominee Elec. Mfg. Co., Menominee Mich.
Moon Mfg. Co., Chicago, Ill. "Eclipse". "Acme", "Knapp".
National Electric Works, Whittier, Cal. "Incitophone".
Partrick, Carter & Wilkins Co., Philadelphia, Pa. "King", "Guarantee", "Competition".
United Electric Apparatus Co., Boston, Mass.

ANNUNCIATOR WIRE. See Wire. Rubber Covered.

ARRESTERS, Lightning. See Lightning Arresters.

ASBESTOS. Sheet. Paper. Millboard. Lumber.
General Bakelite Co., New York. (Asbestos Paper.)
H. W. Johns-Manville Co., New York, N. Y.
Western Electric Co., New York.
Asbestos Wood Co., Nashua, N. H.
Philip Carey Mfg. Co., Cincinnati, Ohio.
Ehret Magnesia Mfg. Co., Philadelphia, Pa.
Franklin Mfg. Co., Franklin, Pa.
R. M. Gilmour Mfg. Co., New York.
Keasbey & Mattison Co., Ambler, Pa.
New Jersey Asbestos Co., Camden, N. J. "Gladiator".
N. Y. Asbestos Mfg. Co., New York.
Norristown Magnesia & Asbestos Co., Norristown, Pa.
H. F. Watson Co., Erie, Pa.

ATTACHMENT PLUGS.
Arrow Electric Co., Hartford, Conn.
Benjamin Electric Mfg. Co., Chicago, Ill. "Benjamin."
Cutler-Hammer Mfg. Co., Milwaukee, Wis. "C-H."
Diehl Mfg. Co., Elizabethport, N. J.
General Electric Co., Schenectady.
Harvey Hubbell, Inc., Bridgeport, Conn. "Hubbell."
Manhattan Electrical Supply Co., New York. "Mesco".
H. T. Paiste Co., Philadelphia.
Pass & Seymour, Inc., Solvay, N. Y. "P. & S."
Peru Electric Co., Peru, Ind.
Simplex Electric Heating Co., Cambridge, Mass. (For heating devices.) "Simplex."
Trumbull Electric Mfg. Co., Plainville, Conn. "Trumbull."
Union Electric Co., Trenton, N. J. "U. E. Co."
Universal Electric Stage Lighting Co., New York, N. Y. "Kliegl Bros."
Western Electric Co., New York.
Bryant Electric Co., Bridgeport, Conn. "Bryant."
E. H. Freeman Electric Co., Trenton, N. J.
Hotpoint Elec. Heating Co., Ontario, Cal. "Hotpoint."
Mueller, R. S., Cleveland, O. "Attacho."
Perkins Electric Switch Mfg. Co., Bridgeport, Conn. "Perkins."
Rice Electric Co., Chicago, Ill. "R. & S. Co."
Tregoning Electric Mfg. Co., Cleveland, Ohio. "Tregoning."
Yost Elec. Mfg. Co., Toledo, O. "Lockfast."

ATTACHMENTS, Gas Fixture.
Faries Mfg. Co., Decatur, Ill.
Trumbull Electric Mfg. Co., Plainville, Conn.
American Brass & Copper Co., New York.
Bryant Electric Co., Bridgeport, Conn.
Plume & Atwood Mfg. Co., Waterbury, Conn.
I. S. Spencer's Sons, Guilford, Conn.
J. H. White Mfg. Co., Brooklyn.

ATTACHMENTS, Outlet Box.
Frorup & Co., L. E., New York, N. Y.

ATTACHMENTS, Socket Chain Adjusters, Chain Extensions, Socket Pulls.
Arrow Electric Co., Hartford, Conn.
Faries Mfg. Co., Decatur, Ill.
General Electric Co., Schenectady, N. Y.
A. E. Rittenhouse Co., Honeoye Falls, N. Y.
Any Lite Incandescent Lamp Regulator Co., North Yakima, Wash. (Regulating Attachment).
Economy Electric Specialty Co., Charlestown, Mass.
Harvey Hubbell, Inc., Bridgeport, Conn.
Phelps Mfg. Co., Detroit, Mich.

AUGERS. See Tools, Digging.

AUTO. STARTERS (For starting A. C. Motors).
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Crocker-Wheeler Co., Ampere, N. J.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady.
Electric Controller & Mfg. Co., Cleveland.
Fairbanks, Morse & Co., Chicago.
Industrial Controller Co., Milwaukee, Wis.
Triumph Electric Co., Cincinnati, Ohio.
Wagner Electric Mfg. Co., St. Louis. "Wagner."
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Allen-Bradley Co., Milwaukee.
Fairbanks-Morse Elect'l. Mfg. Co., Indianapolis, Ind.
U. S. Electrical Mfg. Co., Los Angeles, Cal.

AUTOMOBILES, ELECTRIC.
General Motors Truck Co., Pontiac, Mich.
General Vehicle Co., Long Island City, N. Y. (Commercial Vehicles).
Anderson Electric Car Co., Detroit, Mich. "Detroit-Electric."
Argo Electric Vehicle Co., Saginaw, Mich.
Babcock Electric Vehicle Co., Buffalo, N. Y.
S. R. Bailey & Co., Amesbury, Mass.
Baker Motor Vehicle Co., Cleveland, Ohio.
Borland-Grannis Co., Chicago
Broc Elec. Vehicle Co., Cleveland, Ohio.
Champion Wagon Co., Oswego, N. Y. (Commercial Vehicles).
Chase Motor Truck Co., Syracuse, N. Y. (Repair Wagons).
Columbia Motor Car Co., Hartford, Conn.
Columbus Buggy Co., Columbus, Ohio.
Commercial Truck Co. of America, Philadelphia, Pa.
Couple-Gear Freight Wheel Co., Grand Rapids, Mich. (Gas Electric).
Fritchle Automobile & Battery Co., Denver, Colo.
Grinnell Electric Car Co., Detroit, Mich.
Hupp-Yeats Electric Car Co., Detroit, Mich.
International Motor Co., New York.
Lansden Co., Newark, N. J. (Commercial Vehicles.)
Ohio Electric Car Co., Toledo, Ohio.
Phipps Electric Auto Co., Detroit, Mich.
Ranier Motor Truck Co., New York, N. Y. (Commercial Vehicles).
Rauch & Lang Carriage Co., Cleveland, Ohio.
Standard Electric Car Co., Jackson, Mich.

Wagenhals Motor Co., Detroit, Mich.
Ward Motor Vehicle Co., New York.
Walker Vehicle Co., Chicago.
Waverley Co., Indianapolis, Ind.
Woods Motor Vehicle Co., Chicago, Ill.

AUTOMOBILE LIGHTING SYSTEMS.

Esterline Co., The, Indianapolis, Ind.
General Electric Co., Schenectady, N. Y.
National Metal Molding Co., Pittsburgh, Pa. "Auto-Tube", "Auto-Steelflex", "Brassflex".
Wagner Elec. Mfg. Co., St. Louis, Mo.
Ward Leonard Electric Co., Bronxville, N.Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Willard Storage Battery Co., Cleveland, Ohio. ("Elba" System).
Apple Electric Co., Dayton, Ohio.
Dyneto Electric Co., Elbridge, N. Y.
Electric Auto-Lite Co., South Bend, Ind. "Fisher."
Hartman Electrical Mfg. Co., Mansfield, Ohio.
Holtzer-Cabot Electric Co., Brookline, Mass.
North East Electric Co., Rochester, N. Y.
Standard Electric Novelty Co., Chicago, Ill. (Motor Cycle Headlight).
Stuart-Howland Co., Boston, Mass.
Vivax Storage Battery Co., Chicago, Ill.

BAGS AND BELTS, Linemen's. See Tools, Linemen's.

BAKERS' AND CONFECTIONERS' APPARATUS, Motor Driven.

General Electric Co., Schenectady, N. Y. (Corn Poppers).
Triumph Electric Co., Cincinnati, Ohio. (Bakers' Machinery).
Alsop Process Co., St. Louis, Mo. (Flour Bleaching Apparatus).
Barnhart Mercantile Co., St. Louis, Mo. (Nut Crackers).
Champion Machinery Co., Joliet, Ill. (Bakers' Machinery).
Confectioners' Machinery & Mfg. Co., Springfield Mass. (Chocolate and Candy Machinery).
Consolidated Wrapping Machinery Co., Springfield Mass. ("Knott" Candy Wrapping Machines).
J. H. Day Co., Cincinnati, Ohio.
A. J. Deer Co., Hornell, N. Y. ("Royal" Coffee Roasters).
Hugo Gottschalk & Co., Burnham, Pa. (Pan Cleaning and Greasing Machines).
Hall Kitchen King Mfg. Co., Philadelphia, Pa. (Machine for beating eggs, whipping cream, washing potatoes, straining soups, etc.).
H. L. Hildreth Co., Boston, Mass. (Candy Pulling Machines).
Huntley Mfg. Co., Silver Creek, N. Y. ("Monitor" Coffee Roasters).
Indianapolis Candy Co., Indianapolis, Ind. (Candy Mixers).
Read Machinery Co., York, Pa. (Dough Mixers).
Shaffer Candy Machine Co., New York. (Candy Machinery).
Turnbull Mfg. Co., Columbus, Ohio. (Corn Poppers, Pop Corn Ball and Fritter Machines).
J. S. L. Wharton, Philadelphia, Pa. (Ice Breakers).
Wolf Co., Chambersburg, Pa. (Dough Mixers and Flour Blenders.)

BANDS, Pipe.

American Bridge Co., New York.
Mathew Lanz & Sons, Pittsburgh, Pa.

BARS, Commutator (Bus Bars and Commutator Bars).

Electrical Engineers' Equipment Co., Chicago.
General Devices & Fittings Co., Chicago, Ill.
Billings & Spencer Co., Hartford, Conn.
Columbia Machine Works & Malleable Iron Co., Brooklyn, N. Y.
Eureka Tempered Copper Works, North East Pa.
Forest City Electric Co., Cleveland, Ohio.
Homer Commutator Co., Cleveland, Ohio.
Mansfield Tempered Copper Co., Mansfield, Ohio.
Philadelphia Electric Mfg. Co., Philadelphia.
A. L. Prentiss & Co., Buffalo, N. Y. (Pneumatic Combination Base and Retriever).
Rome Brass & Copper Co., Rome N. Y.

BASES AND SUB-BASES. Snap Switch.

Arrow Electric Co., Hartford, Conn.
General Electric Co., Schenectady, N. Y.
Leon W. Pullen Co., Philadelphia, Pa.
Waterbury Battery Co., Waterbury, Conn. "Excelsior".
Pass & Seymour, Inc., Solvay, N. Y.
Wm. H. Colgan Co., West Newton, Mass. "Rex".
Newton Hublinger, Akron, Ohio.
Kinsey Mfg. Co., Toledo, Ohio.
Perkins Electric Switch Mfg. Co., Bridgeport, Conn.
Tirrill Mfg. Co., Athens, Pa.
Weber Electric Co., Schenectady.

BATTERIES, Dry.

Burnley Battery & Mfg. Co., North East, Pa.
Central Electric Co., Chicago, Ill.
Johns-Manville Co., H. W., New York. "J-M".
Manhattan Electrical Supply Co., New York. "Hi-Up", "Red Seal", "Blue Seal", "Mesco".
National Carbon Co., Cleveland, Ohio. "Columbia," "Columbia Ignitor," "Columbia Multiple," "Helios Storage," "Columbia Hot Shot," "Columbia Duplex."
Nungesser Carbon & Battery Co., Cleveland, Ohio. "Acme Rapid Fire", "1900".
Stackpole Carbon Co., St. Marys, Pa. "Sun", "Wizard", "X-Ray", "Hello", "Autocrat".
Stanley & Patterson, New York. "Patterson" Wireless Dry Battery System, "Matchless" Battery Cells for Flashlights.
The Usona Mfg. Co., Inc., New York, N. Y.
United Battery Corporation, Brooklyn, N. Y.
Western Electric Co., New York. "Crowfoot", "Flashlight", "Leclanche", "Blue Bell".
American Carbon & Battery Co., East St. Louis, Ill.
American Ever Ready Co., New York. "Ever Ready".
Argus Battery Co., Willimantic, Conn. "Odin".
Bright Star Battery Co., New York.
J. H. Bunnell & Co., New York. "Mascot", "Jove", "Standard".
Burn-Boston Battery & Mfg. Works, Boston, Mass. "Burn-Boston", "Noloss".
Edward E. Cary, New York. "Green Seal".
Chloride of Silver Dry Cell Battery Co., Baltimore, Md.
Efficiency Electric Co., Chicago.
Electric Mfg. Co., St. Paul, Minn. "Enco" (Sealed).
Electric Goods Mfg. Co., Canton, Mass. "Sampson Semi-Dry".
Franco American Electric Novelty Co., New York. "Novelty".
French Battery & Carbon Co., Madison, Wis. "Fleur De Lis".
Lincoln Electric Co., New York. "Hi-Po".
Luts-Lockwood Mfg. Co., Roselle, N. J. "Aldene", "8X".
Mills Electric Co., Peoria, Ill. "Local Option".
Wm. Roche, Jersey City, N. J.
Secret Service Dry Battery Co., Everett, Mass. "Secret Service" (For Flashlights only).
Semi-Dry Battery Co., New York. "Dunn".
Standard Electric Novelty Co., Chicago, Ill. (Flashlight)
Universal Carbon Co., Dundee, Ill.
U. S. Auto Battery Co., New York. "Readyspark", "Topnotch".
Voltamp Elec. Mfg. Co., Baltimore, Md.
Westchester Appliance Co., New York.
White Star Battery Co., New York. "White Star", "Red Star".
H. Wilhelm, Brooklyn, N. Y.

BATTERIES, Medical.

Manhattan Electrical Supply Co., New York. "Apollo", "Anti-Doc", "Household", "Home".
National Carbon Co., Cleveland.
W. R. Ostrander & Co., New York. "Criterion".
Stanley & Patterson, New York. "Vetter", "Davis & Kidder", "Electrotonic".
J. H. Bunnell & Co., New York. "Auto-Kure", "Home".
Detroit Medical Battery Co., Detroit, Mich.
Electric Therapeutic Mfg. Co., Indianapolis, Ind.
Matthew Engeln Electric Co., Chicago, Ill.
W. F. Ford & Co., New York.
Kendrick & Davis Co., Lebanon, N. H.
Menominee Elec. Mfg. Co., Menominee, Mich.
D. P. McElliott, Chicago, Ill.
McIntosh Battery & Optical Co., Chicago, Ill.
Wm. Meyer Co., Chicago, Ill.
Oliver Electric Co., Philadelphia, Pa. "Electro-Rol".
Leon W. Pullen Co., Philadelphia, Pa. "Gal-Far".
L. Sence & Son, New York.
Storage Battery Supply Co., New York. "Reliance".
Van Houten & Ten Broeck, New York.
Voltamp Electric Mfg. Co., Baltimore, Md.
Waite & Bartlett Mfg Co., New York.
Wappler Elec. Mfg. Co., New York, N. Y.
Waliman Mfg. Co., Jersey City, N. J.

BATTERIES, Storage.

Edison Storage Battery Co., Orange, N. J.
Electric Storage Battery Co., Philadelphia, Pa. "Stand-By", "Exide", "Hycap-Exide", "Tabor", "Chloride".
Fairbanks, Morse & Co., Chicago.
Gould Storage Battery Co., New York.
Mentzer & Co., J. P., Chicago.
National Carbon Co., Cleveland, Ohio. "Helios."
Philadelphia Storage Battery Co., Philadelphia, Pa. "Diamond Grid".
Prest-O-Lite Co., Inc., Indianapolis.
United States Light & Heating Co., New York. "National", "Unit".
Willard Storage Battery Co., Cleveland, Ohio. "Elba".
Ajax Battery Co., Chicago, Ill.
American Storage Battery Co., Cambridge, Mass. "Harvard".
Apple Electric Co., Dayton, Ohio. "Sixty-Six".
J. F. Ashbrook, Chicago, Ill. "Squires".
Auto Battery & Elec'l Co., Buffalo, N. Y.
Avery Portable Lighting Co., Milwaukee, Wis. ("Electrobola" Automobile Lighting).
The Battery Co., Milwaukee, Wis.
Bison Storage Battery Co., Buffalo, N. Y.
Edward E. Cary, New York. "The Dollar".
Commercial Battery Co., Chicago, Ill. "Combat".
Geissler Bros. Storage Battery Co., New York. "Midget".
Heissler Storage Battery Co., Chicago, Ill.
Helios Mfg. Co., Philadelphia, Pa.
Hoosier Storage Battery Co., Evansville, Ind. "Hobo", "Fire-Fly".
Jewell Electric Co., Chicago, Ill. "U-Auto".
Kuehn & Metz, New York, N. Y.
Lemke Electric Co., Milwaukee, Wis. "L-B".
Hector C. MacRae, Baltimore, Md. "Champion".
Michigan Storage Battery Co., Detroit, Mich. "Michigan."
Miller Storage Battery Co., Toledo, Ohio.
Milwaukee Auto Specialty Co., Milwaukee Wis. "Victor", "Masco", "Rodiuna".
Mound City Battery Co., St. Louis, Mo.
Northwestern Storage Battery Co., Milwaukee, Wis.
Schug Electric Mfg. Co., Detroit, Mich.
Silvey Electric Co., Dayton, Ohio.
Storage Battery Supply Co., New York.
Tray Plate Battery Co., Binghamton, N. Y.
Vesta Accumulator Co., Chicago.
Vivax Storage Battery Co., Chicago, Ill. "Duro".
Winter Battery Co., Chicago, Ill.
Witherbee Igniter Co., Springfield, Mass.
Zoar Battery Co., Zoar, Ohio.

BATTERIES, Wet, Closed Circuit, Open Circuit.

Central Electric Co., Chicago, Ill.
Manhattan Electrical Supply Co. New York.
National Carbon Co., Cleveland Ohio.
American Carbon & Battery Co., East St. Louis, Ill. "Phoenix."
The Battery Co., Milwaukee, Wis. "Gugler".
Banks Elec. & Mfg. Co., New York. (Closed Circuit).
Edison Mfg. Co., Orange, N. J. "ESCO". Closed Circuit.
Electric Goods Mfg Co., Canton Mass. "Hub", "Samson", "Nosmag".
Enterprise Electric Supply Co., Latrobe, Pa. "Franklin"
Jonas Battery Co., Toledo, Ohio.
Leclanche Battery Co., New York. "Gonda", "Tex."
Luts-Lockwood Mfg. Co., Roselle, N. J. ("Gordon" Closed Circuit).
Partrick, Carter & Wilkins Co., Philadelphia, Pa.
Toledo Electric Vehicle Co., Toledo, Ohio.
"Schoenmehl", "Victor" Closed Circuit.
S. S. White Dental Mfg. Co. Philadelphia, Pa. "Parts".

BATTERY BOXES.

L. S. Brach Supply Co., New York, N. Y.
Eureka Supply Co., Sewell, N. J (Moulded fibre battery boxes)

BATTERY HOLDERS.

National Carbon Co., Cleveland, Ohio.
Stanley & Patterson, New York. "Sealed-in". "Watertight" Wireless.
Western Electric Co., New York.
A. S. Campbell Co., Boston, Mass. "Cello".
Eureka Supply Co., Sewell, N. J (Fibre).
E. W. Magna Mfg. Co., Holyoke, Mass.
Mersman Bros., Ottawa, Ohio (Cabinet).
Sumter Tel. Mfg. Co., Sumter, S. C. "Mason".

BEARING METALS.

Magnolia Metal Co., New York.
Phosphor-Bronze Smelting Co., Philadelphia, Pa.

BEARINGS, Ball.

American Ball Bearing Co., Cleveland, Ohio.
Hess-Bright Mfg. Co., Philadelphia, Pa.

BELL RINGING MOTORS.

Roth Bros. & Co., Chicago.
Western Electric Co., New York
Butler Electric Co., David City, Neb.
Empire Transformer Co., Chicago, Ill.
Holtzer-Cabot Electric Co., Brookline, Mass.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.

BELL RINGING TRANSFORMERS. (see Transformers, low voltage).

BELLS, Cable End. See Potheads

BELLS, Electric.

Central Electric Co., Chicago, Ill.
Manhattan Electrical Supply Co., New York. "Imperial", "Monarch", "Peerless", "Nonpareil". "Monitor", "Utility", "Crescent", "Crescendo".
W. R. Ostrander & Co., New York.
P R Mfg. Co., Detroit, Mich. "Eclipse", "XXX", "Mario", "Weather-proof", "Ekla", "Straight Line".
Schwarze Electric Co., Adrian, Mich.
Stanley & Patterson, New York. "Competition", "Globe", "Faraday", "Liberty", "Columbia".
Western Electric Co., New York. "Hawthorn", "Faraday".
Allen Ditson, Galena, Kan.
Ansonia Electrical Co., Ansonia, Conn. "Wizard", "Acme", "Eureka".
J. H. Bunnell & Co., New York. "Beko".
Darche Mfg. Co., Chicago, Ill. "Howdy Do".
Edwards & Co., New York. "Vigilant," "Auto-Recti," "Cadet," "Lungen," "Eco".
Electric Goods Mfg. Co., Canton, Mass. "Dandy", "Tyrolean", "Victor".
Francis Keil & Son, New York "Ampro", "Reliance".
Holtzer-Cabot Electric Co., Brookline, Mass. "Hub", "Dome", "Berlin".
Menominee Elec. Mfg. Co., Menominee, Mich.
Partrick, Carter & Wilkins Co., Philadelphia, Pa.
Spies Electric Co., Chicago, Ill "Separable".
United Electric Apparatus Co., Boston, Mass.

BELLS, Extension. See Magnetos.

BELT DRESSINGS.

Joseph Dixon Crucible Co., Jersey City, N. J.

BELT FASTENERS.

Beloit Co., Waterbury, Conn.
Flexible Steel Lacing Co., Chicago, Ill.
P. Wall Mfg. Supply Co., Pittsburgh, Pa.

BELTING.

Bond Co., Charles, Philadelphia.
Fairbanks, Morse & Co., Chicago.
B. F. Goodrich Co., Akron, Ohio. (Rubber Belting.)
American Laminated Belting Co., New York.
Chicago Rawhide Mfg. Co., Chicago.

Peerless V-Belt Co., Chicago (Chain Drives.)
J. E. Rhoads & Sons, Wilmington, Del.
Chas. A. Schieren Co., New York. "Duxbak" Waterproof Leather Belting.
Shultz Belting Co., St. Louis, Mo.

BENDERS Conduit and Pipe
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Chicago.
Steel City Elec. Co., Pittsburgh, Pa.
Thomas & Betts Co., New York. "Lakin", "Standard".
Western Electric Co., New York.
Austin & Co., M. B., Chicago, Ill.
R. C. Bierdemann & Co., Chicago, Ill. "Star".
Chicago Pneumatic Tool Co., Chicago, Ill. "Little Giant".
J. Filmore Cox & Co., Bayonne, N. J. (Power driven.)
Glaze-Morris Mfg. Co., Columbus, Ohio. "Jem".
Grace, Wm. K., Dallas, Tex.
H. C. Roberts Electrical Supply Co., Philadelphia, Pa. "Victor".
Mayer Bros. Co., Mankato, Minn.
Sanderman Mfg. Co., Willimantic, Conn.
Thos. Wrigley Co., Chicago, Ill.

BINDING POSTS.
Bridgeport Brass Co., Bridgeport, Conn.
Manhattan Electrical Supply Co., New York.
Ostrander & Co., W. B., New York, N. Y.
Stanley & Patterson, New York.
Western Electric Co., New York.
Barnes Co., Wallace, Bristol, Conn.
J. H. Bunnell & Co., New York.
Central Machinery & Supply Co., New York.
Fahnestock Elec. Co., Brooklyn, N. Y. (Spring.)
Foote, Pierson & Co., New York.
Hartford Machine Screw Co., Hartford, Conn.
International Brass & Electric Co., New York.
Meliorate Mfg. Co., Brooklyn, N. Y.
Menominee Elec. Mfg. Co., Menominee, Mich.
National Acme Mfg. Co., Cleveland, Ohio.
Royal Electric Co., Milford, Ind. (Spring.)
Sloan Engineering Co., Brooklyn, N. Y. "Standard."
United Metal Mfg. Co., New York, N. Y.
Victor Electric Co., Chicago, Ill.
Waterbury Mfg. Co., Waterbury, Conn.

BITS. See Drills.

BLOCKS, Fuse. See Cut-outs.

BLOCKS, Meter Testing.
Hart Mfg. Co., Hartford, Conn.
Metropolitan Engineering Co., New York City.

BLOCKS, Moulding. See Moulding Fittings.

BLOWERS AND EXHAUSTERS.
Motor Driven.
Emerson Electric Mfg. Co., St. Louis, Mo.
Fairbanks, Morse & Co., Chicago.
General Electric Co., Schenectady, N. Y.
Mechanical Appliance Co., Milwaukee, Wis. "Watson".
Roth Bros. & Co., Chicago, Ill.
Sprague Electric Works, New York.

BLOWERS, Organ (Motor Driven).
Crocker-Wheeler Co., Ampere, N. J.
Diehl Mfg. Co., Elizabethport, N. J.
Emerson Electric Mfg. Co., St. Louis, Mo.
Fairbanks, Morse & Co., Chicago.
Roth Bros. & Co., Chicago, Ill.

BLUE PRINTING MACHINERY. Electrical.
Buckeye Engine Co., Salem, Ohio.
Keuffel & Esser Co., Hoboken, N. J. "Champion", "Federal".
C. F. Pease Co., Chicago, Ill. (Cutting and Trimming Table.) "Pease Peerless."
Revolute Machine Co., New York. "McAdam", "Everett".
Shaw Blue Print Machine Co., Newark, N. J.
C. J. Toerring Co., Philadelphia, Pa. (Blue Print Drying Machine.)
Topping Bros., New York. "Mechanicograph".
J. H. Wagonhorst & Co., Youngstown, Ohio.
Williams, Brown & Earle, Philadelphia, Pa. "Express". "Franklin".

BOILER FLUE EXPANDERS. See Expanders.

BOILERS, Steam.
Babcock & Wilcox Co., New York. "Cahall", "Stirling", "A. & T.", "Rust".
Westinghouse, Church, Kerr & Co., New York, N. Y.
Archer & Baldwin, New York.
Bigelow Co., New Haven, Conn. "Bigelow-Hornsby".
Chevy-Rouges Co., Chattanooga, Tenn.
Edge Moor Iron Co., Edge Moor, Del.
Erie City Iron Works, Erie, Pa.
Fairbanks-Morse Co., Chicago.
Franklin Boiler Works Co., Troy, N. Y.
Harrisburg Foundry & Machine Co., Harrisburg, Pa. "Star".
Heine Safety Boiler Co., St. Louis, Mo.
E. Keeler Co., Williamsport, Pa.
McNaul Boiler Mfg. Co., Toledo, Ohio.
Milne Water Tube Boiler Co., New York.
Minneapolis Steel & Machinery Co., Minneapolis, Minn.
Murray Iron Works Co., Burlington, Iowa.
New York Safety Steam Power Co., New York.
Oil City Boiler Works, Oil City, Pa. "Geary".
Parker Boiler Co., Philadelphia.
Roth Engineering Co., South Framingham, Mass.
Toledo Flanner Boiler Co., Toledo, O. "Flanner".
Tudor Boiler Mfg. Co., Cincinnati, Ohio. "Lynn".
Wickes Boiler Co., Saginaw, Mich.

BOLTS, Expansion.
Hubbard & Co., Pittsburgh, Pa.
Van Expansion Bolt Mfg. Co., Chicago.
Western Electric Co., New York.
Brohard Co., Philadelphia, Pa.
Chicago Expansion Bolt Co., Chicago, Ill.
Chicago Nut Co., Chicago, Ill. "Ajax."
Isaac H. Church, South Norwalk, Conn. "Perfect". "Duplex". "O K."
Diamond Expansion Bolt Co., New York. "Keystone". "Diamond".
F. H. Evans, Brooklyn, N. Y. "Crescent".
Mathew Lanz & Sons, Pittsburgh, Pa.
McCabe Hanger Mfg. Co., New York, N. Y.
St. Louis Malleable Casting Co., St. Louis, Mo.
A. C. Seaman, Philadelphia, Pa.
Star Expansion Bolt Co., New York. "Sebco".
Steward & Romaine Mfg. Co., Philadelphia, Pa. "Ahlstrom".
U. S. Expansion Bolt Co., New York.
Thos. Wrigley Co., Chicago, Ill.
Yonkers Specialty Co., Yonkers, N. Y. "Metropolitan".

BOLTS, Toggle. See Toggle bolts.

BONDS, SHARES AND SECURITIES.
British American Co., Chicago, Ill.
Electric Bond & Share Co., New York, N. Y.

BOOKS, Technical.
Berkshire Technical Publishing Co., Pittsfield, Mass.
Electrical Review Pub. Co., Chicago, Ill.
D. Van Nostrand Co., New York.

BOOSTERS.
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Ridgeway Dynamo & Engine Co., Ridgeway, Pa.
Triumph Electric Co., Cincinnati.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

BOWLS, Glass. See Glassware.

BOXES, Battery. See Battery Boxes.

BOXES, Conduit.
Adam Elec. Co., Frank, St. Louis, Mo.
Adapti Mfg. Co., Cleveland, O. "Adaptiboxes."
Appleton Electric Co., Chicago, Ill. (Loom, Knockout). "No Thread". "Unilets".
Arrow Electric Co., Hartford, Conn. (Switch.)
Benjamin Electric Mfg. Co., Chicago, Ill. (Weatherproof.)
Bissell Co., F., Toledo, Ohio.
Bossert Co., Utica, N. Y.
Central Electric Co., Chicago, Ill.
Chelton Electric Co., Philadelphia, Pa.
Chicago Fuse Mfg. Co., Chicago, Ill. "Union" Sectional.
Columbia Metal Box Co., New York.
Cutter Co., Philadelphia, Pa. "Munit" Switch Box.
Federal Sign System (Electric), Chicago, Ill.
Hart Mfg. Co., Hartford, Conn. "Diamond H" Switch Boxes.
J. Gordon Knight Electric Co., New York.
National Metal Molding Co., Pittsburgh, Pa. ("National")
Metropolitan Engineering Co., New York City.
H. T. Paiste Co., Philadelphia, Pa. "Pipe Tapiets".
Pass & Seymour, Inc., Solvay, N. Y.
Sprague Electric Works, New York. "Multilet".
Stanley & Patterson, New York City.
Steel City Electric Co., Pittsburgh, Pa. "Star" Stamped Steel Outlet Box. "Fullman". "Steel City". "S. C." Extension Collar. "Flexbox."
Thomas & Betts Co., New York. "Universal" and "Stanley" Outlet Boxes. "T. & B." Cable Boxes.
Western Electric Co., New York.
W. A. Bonnell Co., New York. "All-Let."
Allino Switch Box Mfg. Co., St. Louis, Mo. "Allino."
Bauer Mfg. Co., Cleveland, Ohio. "Bauer."
Bryant Elec. Co., Bridgeport, Conn.
James F. Burns, Philadelphia, Pa. "V. V."
Burns-Pollock Elec. & Mfg. Co., Indiana Harbor, Ind. "B. P."
Crouse-Hinds Co., Syracuse, N. Y. "Condulets".
Duncan Elec. Co., Alton, N. H. "Gem."
Economy Switch Box & Mfg. Co., Cleveland, Ohio. "Economy."
Electric Fuseguard Co., Newark, N. J.
Electrical Mfg. Co., Denver, Colo.
Electrical Specialty Co., Providence, R. I. ("Boss.")
Fancieve Specialty Co., Jamaica Plain Station, Boston, Mass. "Fancieve."
Gillette-Vibber Co., New London, Conn. ("G-V Universal.")
Graves Switch Box Co., Cleveland, Ohio.
Hart & Hegeman Mfg. Co., Hartford, Conn. "H. & H."
Hope, Wm. H., Newark, N. J.
House Elec. Co., W. D., Kansas City, Mo. "W-D".
Hublinger, Newton, Akron, Ohio. ("H. & B.")
Irish Electric Co., New York City. ("Shamrock.")
H. Krantz Mfg. Co., Brooklyn, N. Y. (Elevator Box.)
Machen & Mayer Elec'l Mfg. Co., Philadelphia, Pa. "M. & M."
McIntosh, R. E., Los Angeles, Cal.
Otis Elevator Co., New York City. (Elevator Box.)
Phelps, James C., Springfield, Mass. "J. C. P. Caplet."
Pratt-Chuck Co., Frankfort, N. Y.
Renim Specialty Co., Brighton Station, Boston, Mass.
Standard Electric Fittings Co., Stamford, Conn.
Troy Electrical Co., Troy, N. Y. "Teco."
V. V. Fittings Co., Philadelphia, Pa. "V. V."
Ward, F. H., Brooklyn, N. Y.

BOXES, Floor.
Adam Electric Co., Frank, St. Louis, Mo. ("T. S.")
Bossert Co., Utica, N. Y.
Central Electric Co., Chicago, Ill.
Electrical Engineers Equipment Co., Chicago.
Federal Sign System (Electric), Chicago. "Adjustable".
General Electric Co., Schenectady, N. Y.
General Devices & Fittings Co., Chicago, Ill.
Manhattan Electrical Supply Co., New York. "Mesco".
Sprague Electric Wks., New York City.
Stanley & Patterson, New York. "Fielding". "Patterson".
Steel City Electric Co., Pittsburgh, Pa. "Fullman".
Thomas & Betts Co., New York. "T. & B."
Universal Elec. Stage Lighting Co., New York. "Kliegl Bros."
W. A. Bonnell Co., New York. "Bonnell."
Krantz Mfg. Co., H., Brooklyn, N. Y.
Lord Mfg. Co., New York. "Knickerbocker."
Lutz Webster Eng. Co., Inc., Philadelphia, Pa. ("Lutz.")
Russell & Stoll Co., New York. "Russell."
United Electrical Construction Co., Chicago, Ill.
Universal Electric Stage Lighting Co., New York. "Kliegl."

BOXES, Junction. (See Boxes, Conduit.)

BOXES, Manhole.
Columbia Metal Box Co., New York.
D & W Fuse Co., Providence R. I.
General Electric Co., Schenectady
H. W. Johns-Manville Co., New York.
Metropolitan Engineering Co., New York City.
Standard Underground Cable Co., Pittsburgh, Pa.
Electric Fuseguard Co., Newark, Newark, N. J.
G. & W. Electric Specialty Co., Chicago, Ill.
United Electric Apparatus Co., Boston, Mass.

BOXES, Outlet. See Boxes, Conduit.

BOXES, Service, Sheet Steel and Cast Iron Entrance Boxes and Cabinets Cabinets.
Frank Adam Electric Co., St. Louis, Mo.
Adapti Mfg. Co., Cleveland, O.
F. Bissell Co., Toledo, Ohio. "Security" Cabinets.
Brady Electric Mfg. Co., New Britain, Conn.
Columbia Metal Box Co., New York. "Columbia Quality."
Connecticut Electric Mfg. Co., Bridgeport, Conn.
Cutter Co., South Bend, Ind.
D & W Fuse Co., Providence R. I.
Delta-Star Electric Co., Chicago.
Federal Sign System (Electric), Chicago, Ill.
General Electric Co., Schenectady, N. Y. "G. E."
Hamilton Sheet Metal Wks., Hamilton, Ohio.
H. W. Johns-Manville Co., New York.
Metropolitan Engineering Co., New York City.
National Metal Molding Co., Pittsburgh, Pa.
H. T. Paiste Co., Philadelphia.
Palmer Electric & Mfg. Co., Boston, Mass.
Post-Glover Elec. Co., Cincinnati, Ohio.
Trio Mfg. Co., Rock Island, Ill.
Trumbull Electric Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg Co., Bantam, Conn.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
A. G. Electric & Mfg. Co., Seattle, Wash.
Almstead Mfg. Co., Rochester N. Y.
Allsteelequip Co., Aurora, Ill.
Carstarphen Elec. Co., Denver Colo.
Cleveland Switchboard Co Cleveland, Ohio. (Cabinets.)
Commercial Electric Co., New Orleans, La.
Commercial Switchboard Mfg Co., Denver, Colo. (Steel.)
Consolidated Sheet Metal Works Milwaukee, Wis.
Crouse-Hinds Co., Syracuse, N. Y.
Cuthbert Electrical Mfg. Co. Chicago, Ill.
Electric Fuseguard Co., Newark, N. J.
Electric Mfg. Co., New Orleans, La.
Electrical Mfg. Co., Cleveland, Ohio. "E. M. Co."
Electrical Mfg. Co., Denver, Colo
Erie Art Metal Co., Erie, Pa.
Fancieve Specialty Co., Jamaica Plain, Mass.
Flint Elec. & Mfg. Co., Denver, Colo.
Greater New York Paper Box Co., New York.
Guilderland Foundry Co., Guilderland, N. Y. "G. F. Co."
Hauer, J. B., Brooklyn, N. Y.
J. P. Mfg. Co., Niverville, N. Y.
Johnson, C. A., San Francisco, Cal.
Johnson, H. H., San Francisco, Cal.
Johns-Pratt Co., Hartford, Conn.
Kirtland Elec. Construction Co., Albany, N. Y.
Koschin Co., Milwaukee, Wis.
H. Krantz Mfg. Co., Brooklyn.
Kruse Electrical Mfg. Co., Ft. Wayne, Ind. (Cabinets.)
Web. A. Lemley, New Orleans, La.
Leonard-Bundy Electric Co., Cleveland, Ohio. (Cabinets.)
Lyon Metallic Mfg. Co., Aurora, Ill.
Mesker & Bro., St. Louis, Mo.
Metropolitan Electric Mfg. Co., Long Island City, N. Y.
Milwaukee Vault & Electric Cabinet Box Co., Milwaukee, Wis.
Mutual Electric & Machine Co., Wheeling, W. Va.
Newgard & Co., Henry, Chicago, Ill.
Portland Elec. Maintenance Co., Portland, Ore.
Portland Railway, Light & Power Co., Portland, Ore.
Geo. F. Rohn, Milwaukee, Wis.
Schmidt Electric Co., A. R., Milwaukee, Wis. (Steel Cabinets.)
Standard Electric Fittings Co., Stamford, Conn.
Standard Mechanical Equipment Co., Dallas, Texas.
Star Metal Box Co., New York City.
Sterling Switchboard Co., Camden, N. J.

Superior Elec. Mfg. Co., Minneapolis, Minn.
Erie Mfg. Co., Rock Island, Ill.
Troy Electric Co., Troy, N. Y. "Teco".
United Sheet Metal Wks., San Francisco, Cal.
V. V. Fittings Co., Philadelphia, Pa. "V. V."
Warder, Clark & Chaplin Mfr Co., Rochester, N. Y.
Western Elec. Works, Portland, Ore.
Wheeler-Green Elec. Co., Rochester, N. Y.
Worcester Electric & Mfg. Co., Worcester, Mass.
Wurdack Electric Mfg. Co., St. Louis, Mo.
George H. Young, Elmira, N. Y.

BOXES, Spark Coil (Waterproof).
Stanley & Patterson, New York. "Watertite".
Churchill Cabinet Co., Chicago, Ill.
Household Cabinet Works, Providence, R. I.
Standard Cabinet Mfg. Co., Peru, Ind.
Union Hardware Co., Torrington, Conn.
F. M. West Box Co., Springfield, Mass.

BOXES, Starting. See Rheostats.

BOXES, Switch. See Boxes, Conduit.

BOXES, Wood. (Telephone Boxes; Wood Cabinets.)
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
American Hardwood Mfg. Co., Grottoes, Va.
Bauerle & Stark Co., Chicago, Ill.
C. & P. Electric Works, Springfield, Mass.
Churchill Cabinet Co., Chicago.
Cleveland Switchboard Co., Cleveland, Ohio.
Columbia Machine Works & Malleable Iron Co., Brooklyn, N. Y. (Fuse Boxes.)
Corcoran & Co., Chicago, Ill.
Crouse-Hinds Co., Syracuse, N. Y. Panel Boxes.
Findelsen & Kropf Mfg. Co., Chicago, Ill.
F. L. Heyden Co., Chicago, Ill.
Interstate Electric & Mfg. Co., Sioux City, Iowa.
Machen & Mayer Electrical Mfg. Co., Philadelphia, Pa. "M. & M." Wood Panel Boxes.
Metropolitan Elec. Mfg. Co., Long Island City, N. Y.
United Electric Apparatus Co., Boston, Mass.
Wm. Thies & Son, Huntingburg, Ind.
Ernest Topf, New York.
Wabash Cabinet Co., Wabash, Ind.
Wisconsin Chair Co., Port Washington, Wis.

BRACES, Cross Arm.
F. Bissell Co., Toledo, Ohio. "Security".
Hubbard & Co., Pittsburgh, Pa.
Line Material Company, South Milwaukee, Wis.
Western Electric Co., New York.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Benicia Iron Works, San Francisco, Cal.
Buffalo Steel Co., Tonawanda, N. Y.
Cleveland Galvanizing Works Co., Cleveland, Ohio.
Creaghead Engrg. Co., Cincinnati, Ohio.
Hallett Iron Works, Harvey, Ill.
Inland Steel Co., Chicago, Ill.
Kinsey Mfg. Co., Toledo, Ohio. (Back Brace.)
M. Lanz & Sons, Pittsburgh, Pa.
Fred L. Meckel, Chicago, Ill.
Michigan Bolt & Nut Works, Detroit, Mich.
Newhall Chain, Forge & Iron Co., New York.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Schaper Construction Material Co., New York, N. Y.

BRACKETS, Arc Lamp (for outdoor and shop use.
Geo. Cutter Co., South Bend, Ind.
Line Material Co., So. Milwaukee, Wis.
Western Electric Co., New York.
Casey-Hedges Co., Chattanooga, Tenn.
Central Foundry Co., New York City.
Fletcher Mfg. Co., Dayton, Ohio.
Lundin Electric & Mach. Co., Boston, Mass.
McCrosky-Reamer Co., Meadville, Pa.
Morris, Elmer P., New York City.
Mott Iron Works, J. L., New York, N. Y.
Philadelphia Electric Mfg. Co., Philadelphia.
Wheeler Reflector Co., Boston, Mass.

BRACKETS, ARMS AND PINS (Iron).
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
Brady Electric Mfg. Co., New Britain, Conn.
Geo. Cutter Co., South Bend, Ind.
Delta-Star Electric Co., Chicago.
Electrical Engineers' Equipment Co., Chicago, Ill.
Faries Mfg. Co., Decatur, Ill.
General Devices & Fittings Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Hubbard & Co., Pittsburgh, Pa. ("Pierce" Insulator Brackets).
Line Material Co., So. Milwaukee, Wis. (Steel and Malleable.)
Ohio Brass Co., Mansfield, Ohio.
Arthur Bros., Manchester, N. H. (Adjustable Break Arms).
Creaghead Engrg. Co., Cincinnati, O. "Flexible".
Diamond Steel Pole Co., Philadelphia, Pa.
Electric Railway Equipment Co., Cincinnati, Ohio.
Electric Service Supplies Co., Philadelphia, Pa. "Keystone".
Fletcher Mfg. Co., Dayton, Ohio.
Frank B. Hall, Newton Falls, Ohio. (Pressed Steel Brackets).
Hallett Iron Works, Harvey, Ill.
M. Lanz & Sons, Pittsburgh, Pa.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Philadelphia Electric Mfg. Co., Philadelphia.
St. Louis Malleable Casting Co., St. Louis, Mo. (Brackets and Fret Insertion Pins).

BRACKETS, Pothead.
F. Bissell Co., Toledo, Ohio. "Security".
Electrical Engineers' Equipment Co., Chicago.
General Devices & Fittings Co., Chicago, Ill.
Fairmount Electric & Mfg. Co., Philadelphia, Pa.
Philadelphia Electric Mfg. Co., Philadelphia.

BRACKETS, Telephone. (For supporting Telephone Instruments).
American Steel & Wire Co., Chicago. "Peerless Fonarm".
American Telephone Co., Chicago, Ill. "Burns," "Burns Hi-Lo" "Economy," "Radio".
Manhattan Electrical Supply Co., New York. "Mesco".
Stanley & Patterson, New York. "Imperial".
Western Electric Co., New York.
Alliance Specialty Mfg. Co., Alliance, Ohio.
Chicago Writing Machine Co., Galesburg, Ill. "Adjustophone".
Connecticut Telephone & Electric Co., Meriden, Conn.
Frank B. Cook, Chicago.
De Veau Telephone Mfg. Co., Brooklyn, N. Y. "Victor".
Holtzer-Cabot Electric Co., Brookline, Mass.
K. & B. Co., Philadelphia, Pa.
McLeod-Ward & Co., New York. "Ward".
Meilink Mfg. Co., Toledo, Ohio.
Oliver Mfg. Co., Philadelphia, Pa. "Ad-a-link". "Equipoise".
Seely Office Appliance Co., New York.
C. L. Van Akin, Jr., Liverpool, N. Y.
Warner Electric Co., Muncie, Ind.
Wilhelm Telephone Mfg. Co., Buffalo, N. Y.

BRACKETS, Wood. See Pins.

BRAKES, Electric—Magnetic.
Electric Controller & Mfg. Co., Cleveland, Ohio.
Industrial Controller Co., Milwaukee, Wis.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

BRAKES, Dynamo.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Industrial Controller Co., Milwaukee, Wis.

BRAKES, Electric.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, Ohio.
General Electric Co., Schenectady, N. Y.
Sundh Electric Co., New York.
Western Electric Co., New York.

BRANCH BLOCKS. See Cut-Outs, also Moulding Blocks.

BRANDING IRONS. See Soldering Irons.

BRASS AND COPPER (In Bars, Rods and Sheets).
Bridgeport Brass Co., Bridgeport, Conn.
Ansonia Brass & Copper Co., New York.
Benedict & Burnham Mfg. Co., Waterbury, Conn.
Coe Brass Mfg. Co., Torrington, Conn.
Detroit Copper & Brass Rolling Mills, Detroit, Mich.
Hendrick Bros., New York.
O. T Hungerford Brass & Copper Co., New York.
C. G. Hussey & Co., Pittsburgh, Pa.
Manhattan Brass Co., New York.
New Haven Copper Co., Seymour, Conn.
New Jersey Tube Co., Harrison, N. J.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rome Brass & Copper Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Taunton-New Bedford Copper Co., Taunton, Mass.
Waterbury Brass Co., Waterbury, Conn.

BRASS TUBING. See Tubing.

BREAK ARMS. See Brackets, Arms and Pins.

BRIDGES.
American Bridge Co., New York.

BRIDGES, Railroad and Highway.
American Bridge Co., New York.

BRIDGES AND TOWERS, Coal Handling.
American Bridge Co., New York.

BRUSHES. Carbon and Graphite.
Calebaugh Self-Lubricating Carbon Co., Philadelphia, Pa.
Central Electric Co., Chicago.
Chas. E. Chapin Co., Inc., New York.
Joseph Dixon Crucible Co., Jersey City, N. J.
General Electric Co., Schenectady, N. Y.
Holmes Fibre Graphite Mfg. Co., Philadelphia, Pa.
Le Valley Vitae Carbon Brush Co., New York, N. Y.
Morgan Crucible Co., Ltd., New York.
National Carbon Co., Cleveland.
Nungesser Carbon & Battery Co., Cleveland, Ohio.
Pure Carbon Co., Wellsville, N. Y.
Hugo Reisinger, New York. (Importer "Brouskol").
Speer Carbon Co., St. Marys, Pa. "Long Life."
Stackpole Carbon Co., St. Marys, Pa.
Triumph Electric Co., Cincinnati, O.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
American Carbon & Battery Co., East St. Louis, Ill.
Barkelew Electric Mfg. Co., Middletown, Ohio. "Sparkless."
Baylis Co., Bloomfield, N. J.
Becker Bros., Chicago, Ill. "Perfection."
Buxbaum & Cooley, Seattle, Wash.
Graphite Metallizing Corporation, Yonkers, N. Y.
Hart & Co., Fostoria, Ohio. "Langleben."
W. J. Jeandron, New York. (Importer "Le Carbone.")
United States Carbon Co., New York. "U. S. Efficient."
Universal Carbon Co., Dundee, Ill.

BRUSHES, Metallic.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
Central Electric Co., Chicago.
Chas. E. Chapin Co., Inc., New York, N. Y.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
National Carbon Co., Cleveland, O. "Cophite."
Nungesser Carbon & Battery Co., Cleveland, O.
Triumph Electric Co., Cincinnati, O.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Berkelew Electric Mfg. Co., Middletown, Ohio.
Crown Woven Wire Brush Co., Salem, Mass.
Chemelectric Co., Chicago. "Lubricating Brushes."
Eureka Tempered Copper Works North East, Pa. (Sheet Metal.)
James Goldmark Co., New York. "German-American."
Graphite Metallizing Corporation, Yonkers, N. Y.
Hart & Co., Fostoria, Ohio.
James E. McMurty & Co., Chicago, Ill.
Ohio Electric Specialty & Mfg. Co., Troy, Ohio. "Perfection".
Philadelphia Elec'l & Mfg. Co., Philadelphia, Pa. (Sheet Metal.)
Thompson-Bonney Co., Brooklyn, N. Y. "Acme".
United States Carbon Co., New York.

BRUSHES, Pneumatic.
(For larger sizes, see Air Compressors.)
Bishop & Babcock Co., Cleveland, O.
Chicago Pneumatic Tool Co., Chicago, Ill.
General Compressed Air House Cleaning Co., St. Louis, Mo.
Kny-Scheerer Co., New York.
Paasche Air Brush Co., Chicago.
Pelton & Crane Co., Detroit.
P. Pfeffer, Newark, N. J. "Universal".
Standard Automatic Mfg. Co., New York.
Victor Electric Co., Chicago, Ill., (Air Compressor Outfit.)
O. C. Woid, Chicago, Ill.

BRUSH HOLDERS.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
Baylis Co., Bloomfield, N. J. "Reaction".
Par Sil Metal Co., Lansdale Pa.

BUFFERS, Portable. See Tools, Portable.

BUILDINGS, Office and Mill.
American Bridge Co., New York.

BUNKERS AND HOPPERS.
American Bridge Co., New York.

BURGLAR ALARMS. (Window and door attachments.) (See also Matting.)
Manhattan Electrical Supply Co., New York.
W. R. Ostrander & Co., New York.
Stanley & Patterson, New York.
Western Electric Co., New York.
Edwards & Co., New York.
Otto Bernz, Newark, N. J.
Farrington & Co., Mt. Vernon, N. Y.
United Electric Apparatus Co., Boston, Mass.

BURNERS, Gas Lighting.
Automatic Appliance Co., Boston, Mass. (Automobile.)
A. L. Bogart, New York. ("Bartholdi" Automatic.)
Cleverly Electric Works, Philadelphia, Pa.
Electric Goods Mfg. Co., Canton, Mass. ("Boston" Automatic, "Advance" Pendant, "Prefex" Automobile Gas Lighter.)
Holtzer-Cabot Electric Co., Brookline, Mass.
Inst. Lighter Co., Columbus, O.
Motor Specialties Co., Boston, Mass. Automobile.
J. Y. Park & Co., Philadelphia, Pa. "Jypco".
H. C. Roberts Electrical Supply Co., Philadelphia, Pa. "Victor".

BUS BARS. See Bars.

BUS BAR SUPPORTS.
Delta-Star Eelectric Co., Chicago.
Electrical Engineers' Equipment Co., Chicago.
General Devices & Fittings Co., Chicago, Ill.

BUSHINGS AND LOCKNUTS. (For Conduit.)
Adapti Mfg. Co., Cleveland, Ohio. ("Adaptiboxes.")
Appleton Electric Co., Chicago. ("No-Thread.")
Arrow Electric Co., Hartford, Conn.
Bossert Co., Utica, N. Y. "Erickson" and "Monitor" Bushings.
Crouse-Hinds Co., Syracuse, N. Y. ("Conduleta.")
Faries Mfg. Co., Decatur, Ill.
Federal Sign System (Electric), Chicago, Ill.
General Electric Co., Schenectady, N. Y.
National Metal Molding Co., Pittsburgh, Pa. ("National.")
Palaie Co., H. T., Philadelphia, Pa.
Speer Carbon Co., St. Marys, Pa.
Sprague Electric Works, New York.
Steel City Electric Co., Pittsburgh, Pa. "Star" & "Fullman" Bushings.
Thomas & Betts Co., New York. "T. & B".
W. A. Bonnell Co., New York.
Chase-Shawmut Co., Newburyport, Mass. ("Shawmut.")
Electrical Specialty Mfg. Co., Providence, R. I. "Boss".
Everhard Mfg. Co., Canton, Ohio. ("Diamond E.")
Fairmont Elec. Mfg. Co., Philadelphia, Pa.
Gillette-Vibber Co., New London, Conn. ("G-V Universal.")
Grabler Mfg. Co., Cleveland.
Hart & Hegeman Mfg. Co., Hartford, Conn.
New Process Specialty Co., Inc., Milwaukee, Wis.
McCabe Supply Co., Wilkes-Barre, Pa.
Otis Elevator Co., Chicago, Ill.
Phelps, James C., Springfield, Mass.
Rockwood Sprinkler Co. of Mass., Worcester, Mass. ("R. S. Co.")
Spark Electric Co., Kansas City, Mo. ("Branchlet Tee and Y Fittings.")
Standard Electric Fittings Co., Stamford, Conn.
Troy Electrical Co., Troy, N. Y. ("Teco.")
V. V. Fittings Co., Philadelphia, Pa. ("V. V." Fittings.)

Wilkes Barre Indicator Co., Wilkes Barre, Pa. ("Jiffy Bushing.")
BUSHINGS, Porcelain Clamping.
Appleton Electric Co., Chicago.
Federal Sign System (Electric) Chicago, Ill. "Federal."
General Electric Co., Schenectady, N. Y.
Pass & Seymour, Inc., Solvay, N. Y. "P. & S."
American Bushing Co., Chicago, Ill. "Am. Bush. Co."
W. A. Bonnell Co., New York.
Harter Mfg. Co., Chicago, Ill. "Har-ter."
Phelps Mfg. Co., Detroit, Mich.
Pisch, Jr., Frank, New York City.
Thordardson Electric Mfg. Co., Chicago. "Thordarson."
Troy Electrical Co., Troy, N. Y.
V. V. Fittings Co., Philadelphia.
BUSHINGS, Socket.
Arrow Electric Co., Hartford, Conn.
Dickinson Mfg. Co., Springfield, Mass.
Hemming Mfg. Co., Garfield, N. J.
Scranton Button Co., Scranton, Pa. (Composition.)
Western Electric Co., New York
American Hard Rubber Co., New York.
Auburn Button Works, Auburn N. Y. (H. A. Caesar & Co., New York, Sole Selling Agents.) (Composition.)
A. S. Brock Rubber Co., Boston, Mass.
Electrose Mfg. Co., Brooklyn, N. Y. (Composition.)
Walpole Tire & Rubber Co., Walpole, Mass.
Siemon Hard Rubber Corporation, Bridgeport, Conn.
Frank H. Stewart Electric Co., Philadelphia, Pa. "Knostrain."
CABINETS, Iron. See Boxes, Service.
CABINETS, Wood. See Boxes, Wood.
CABLES. (See also Wire.)
American Electrical Works, Philipsdale, R. I.
American Steel & Wire Co., Chicago, Ill.
Atlantic Insulated Wire & Cable Co., New York, N. Y.
Belden Mfg. Co., Chicago, Ill.
Central Electric Co., Chicago, Ill.
Brixey, W. R., New York, N. Y.
Electric Cable Co., New York.
General Electric Co., Schenectady, N. Y.
Habirshaw Wire Co., New York.
Hazard Mfg. Co., Wilkesbarre, Pa.
Kerite Insulated Wire & Cable Co., New York, N. Y.
Moore, Alfred F., Philadelphia, Pa.
National Conduit & Cable Co., New York, N. Y.
Okonite Co., The, New York, N. Y.
Roebling's Sons Co., John A., Trenton, N. J.
Safety Insulated Wire & Cable Co., New York, N. Y.
Simplex Wire & Cable Co., Boston. "Simcore", "Simplex Caoutchouc" (Simplex "B. C.").
Standard Underground Cable Co., Pittsburgh, Pa.
Waterbury Co., Waterbury, Conn.
Western Electric Co., New York.
CABLES, Armored. (Flexible.)
National Metal Molding Co., Pittsburgh, Pa. "Flexsteel."
Sprague Electric Works, New York. "Greenfield", "B-X".
Standard Underground Cable Co., Pittsburgh, Pa.
Western Conduit Co., Youngstown, Ohio. "Realflex".
Boston Insulated Wire & Cable Co., Boston, Mass.
Central Tube Co., Pittsburgh, Pa.
Columbia Metal Hose Wks., Bayonne, N. J.
Eastern Flexible Conduit Co., Brooklyn, N. Y.
Pratt Chuck Co., Frankfort, N. Y.
Safety-Amorite Conduit Co., Pittsburgh, Pa. "Sterling."
Trenton Electric & Conduit Co., Trenton, N. J.
CABLE BELLS. (See Potheads.)
CABLE GRIPS.
Universal Cable Grip Co., Syracuse, N. Y. (Red Top) "Universal."
CABLE HANGERS.
A. & J. M. Anderson Mfg. Co., Boston, Mass.
Appleton Electric Co., Chicago.
F. Bissell Co., Toledo, Ohio.
Conduit Electrical Mfg. Co., Boston, Mass.
Hubbard & Co., Pittsburgh, Pa.
Metropolitan Engineering Co., New York City.
Standard Underground Cable Co., Pittsburgh, Pa. "Nordyke Support."
Western Electric Co., New York.
American Twist Drill Co., Laconia, N. H. "Union."
Anderson Tool & Supply Co., Detroit, Mich. (For Manholes).
Aurora Cable Clip Co., Aurora, Ill.
Baugh Cable Clip Co., Hopkinsville, Ky.
Cameron Appliance Co., Everett, Mass. "Locke".
Chase-Shawmut Co., Newburyport, Mass. (Marlin.)
Frank B. Cook, Chicago, Ill.
H. P. Copeland, Jersey City, N. J. "H. P".
Eureka Supply Co., Sewell, N. J. "Rex".
Hallett Iron Works, Harvey, Ill.
W. N. Matthews & Bro., St. Louis, Mo.
Michigan Bolt & Nut Works, Detroit, Mich.
Minerallac Electric Co., Chicago.
National Telephone Supply Co., Cleveland, Ohio.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Pettingell-Andrews Co., Boston, Mass. "O'Neill".
Rhode Island Telephone & Electric Co., Providence, R. I. "Wright".
Star Expansion Bolt Co., New York.
Yonkers Specialty Co., Yonkers, N. Y. "I-Let", "Metropolitan".
CABLE PULLING TOOLS. (See Tools.)
CABLE RACKS. (for indoor and vault use.)
T. J. Cope, Estate, Philadelphia.
Electrical Engineers Equipment Co., Chicago.
General Electric Co., Schenectady, N. Y.
General Devices & Fittings Co., Chicago, Ill.
Metropolitan Engineering Co., New York City.
Standard Underground Cable Co., Pittsburgh, Pa.
Universal Cable Grip Co., Syracuse, N. Y. "Universal."
Mathew Lanz & Sons, Pittsburgh, Pa.
CABLE ROLLERS.
Fairmount Electric & Mfg. Co., Philadelphia, Pa.
W. N. Matthews & Bro., St. Louis, Mo.
CABLE SPLICING JOINTS.
W. N. Matthews & Bro., St. Louis, Mo.
CABLE SUPPORTING CLAMPS. (See Clamps, Cable Supporting.)
CABLE TESTERS. (See also instruments, Testing.)
Roller-Smith Co., New York.
Metropolitan Engineering Co., Brooklyn, N. Y.
Standard Underground Cable Co., Pittsburgh, Pa.
W. N. Matthews & Bro., St. Louis, Mo.
Minerallac Electric Co., Chicago.
CABLING MACHINES. (See also Covering Machines.)
New England Butt Co., Providence, R. I.
CALIBRATORS, Meter.
Fort Wayne Electric Works, Ft. Wayne, Ind. "Wood".
General Electric Co., Schenectady, N. Y.
Roller-Smith Co., New York.
Sangamo Electric Co., Springfield, Ill.
CALLS, Carriage. (See Carriage Calls.)
CANDLES, Electric. (See Flashlights.)
CANDLES, Glass, Candelabra Fixtures.
Phoenix Glass Co., New York.
Fensterer & Ruhe, New York, N. Y.
Gill & Co., Washington Flint Glass Works, Philadelphia, Pa.
Gleason-Tiebout Glass Co., Brooklyn, N. Y.
H. G. McFaddin & Co., New York. (Importers.)
CANOPY INSULATORS.
Faries Mfg. Co., Decatur, Ill.
General Electric Co., Schenectady, N. Y.
Mica Insulator Co., New York, N. Y. "Young".
E. E. Bechtold, Chicago, Ill. "E. E. B."
Kelting Elec. Co., Inc., New York City. "Knu."
Macallen Co., Boston, Mass.
CANOPIES, Fixture. See Shells, Chandelier.
CAPS, Conduit. See Fittings, Conduit.
CAPS, Inc. Lamp. Color Caps.
A. & W. Electric Sign Co., Cleveland, Ohio.
Betts & Betts Corporation, New York.
Lord Mfg. Co., New York.
Reynolds Elec. Flasher Mfg. Co., Chicago, Ill.
CAPSTANS, Cable Pulling. (See Tools, Cable Pulling.)
CARBONS, Arc Light.
Central Electric Co., Chicago, Ill.
L. E. Frorup & Co., New York. (Importers "Alba", "Siemens", "Arco").
General Electric Co., Schenectady, N. Y.
National Carbon Co., Cleveland, Ohio. "Silvertip", "Columbia", Blueprinting, "Columbia Projector, Engraving, Miniature, Photographic, Searchlight, Welding.
Hugo Reisinger, New York. (Importer) "Nuernberg", "Excello", "Electra".
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Edward E. Cary, New York. (Importers "Fabius Henrion".)
H. M. Hirschberg, New York, N. Y. (Importer "Plania").
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Chas. L. Kiewert Co., Milwaukee, Wis. (Importers "Bio").
United States Carbon Co., New York.
CARBONS, Battery.
Manhattan Electrical Supply Co., New York.
National Carbon Co., Cleveland, Ohio.
Speer Carbon Co., St. Marys, Pa.
Stackpole Carbon Co., St. Marys, Pa. (Pencil only.)
American Carbon & Battery Co., East St. Louis, Ill.
Edward E. Cary, New York. (Importers "Fabius Henrion".)
Telephone Carbon Co., Brooklyn, N. Y.
Universal Carbon Co., Dundee, Ill.
CARBON REMOVER
Ever-Ready Mfg. Co., St. Louis, Mo.
CARBON SPECIALTIES.
Circuit-breaker contacts, crucibles, diaphragms, discs, globular carbon, granular carbon, lightning arresters, packing rings, plungers, rods, sticks, tubes, welding carbons.
National Carbon Co., Cleveland, Ohio.
Universal Carbon Co., Dundee, Ill.
CARBOY INCLINATORS.
McCord & Co., Horace, M., Minneapolis, Minn.
CAR HEATING, Electric.
H. W. Johns-Manville Co., New York.
Simplex Electric Heating Co., Cambridge, Mass.
Western Electric Co., New York.
Consolidated Car Heating Co., Albany, N. Y.
CAR LIGHTING SYSTEMS.
Gould Storage Battery Co., New York.
United States Light & Heating Co., New York. "United States", "Bliss", "Moskowitz".
Consolidated Ry. Elec. Ltg. & Equipment Co., New York. "Axle Light".
Dake-American Steam Turbine Co., Grand Rapids, Mich.
Safety Car Heating & Lighting Co., New York. (Axle Driven Dynamo.)
CARRIAGE CALLS.
Edwards & Co., New York.
Electric Carriage Call & Specialty Co., New York.
Universal Electric Stage Lighting Co., New York. "Kliegl Bros."
CARS, Derrick.
American Bridge Co., New York.
CARS, Messenger or Cable. (See Trolleys.)
CARTS, Linemen's.
Mathias Klein & Sons, Chicago.
Oshkosh Mfg. Co., Oshkosh, Wis.
Dicke Tool Co., Downers Grove, Ill.
CASES, Battery. See Battery Holders.
CASTINGS.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
Faries Mfg. Co., Decatur, Ill.
Metal Specialties Mfg. Co., Chicago, Ill.
New England Butt Co., Providence, R. I.
Stanley & Patterson, New York. "Bestelectric".
Triumph Electric Co., Cincinnati, Ohio.
Buffalo Foundry & Machine Co., Buffalo, N. Y.
Fee & Mason, New York.
Industrial Novelty Co., Chicago.
Inventor's & Mfgr's Sales Co., San Francisco, Cal. "Marvelous".
Mahoney Bros., Chicago, Ill. "Chicago".
Minneapolis Steel & Machinery Co., Minneapolis, Minn.
Standard Mfg. Co., Auburn, Ind. "Crown" (Pendant.)
Wallace Foundry & Mach. Co., Lafayette, Ind.
CEILING FANS.
See Fans.
Railway and Industrial Engineering Co., Greenburg, Pa.
CEMENT, Cable, Transformer.
Walpole Tire & Rubber Co., Walpole, Mass.
CEMENT, Commutator Repairing.
See Commutator Cement.
CEMENT MACHINERY.
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
CHAIN, Chandelier.
Faries Mfg. Co., Decatur, Ill.
E. C. Bliss Mfg. Co., Providence, R. I.
Cryptofil Chain Co., Boston, Mass.
Virden Mfg. Co., Cleveland, Ohio.
Woodhouse Chain Works, Trenton, N. J.
CHAIN, (for Pull Sockets).
Arrow Electric Co., Hartford, Conn.
CHAINS, Arc Lamp Hoisting.
Onieda Community, Ltd., Oneida, N. Y.
CHAINS, Cable Stringing.
See Trolleys.
CHAINS, Drive.
See Belting.
CHAINS, Power Transmission
Morse Chain Co., Ithaca, N. Y.
CHAINS, Silent Driving.
Morse Chain Co., Ithaca, N. Y.
CHAINS, Twin Roller, Bicycle.
Morse Chain Co., Ithaca, N. Y.
CHANDELIERS (See also Fixtures.)
Beardslee Chandelier Mfg. Co., Chicago, Ill.
Central Electric Co., Chicago, Ill.
Faries Mfg. Co., Decatur, Ill.
Tungstoller Works of General Electric Co., Cleveland, O.
CHANGERS. See Lamp Changers.
CHANGERS, Pole.
See Pole Changers.
CHARGING OUTFITS.
(For Charging Storage Batteries on D. C. Circuits. For A. C. Circuits, see Rectifiers.)
Crocker Wheeler Co., Ampere, N. J. (Motor Generators.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse Co., Chicago
General Electric Co., Schenectady, N. Y. (Motor Generator.)
Lincoln Electric Co., Cleveland, Ohio, (Motor Generators.)
Mechanical Appliance Co., Milwaukee, Wis.
Wagner Elec. Mfg. Co., St. Louis, Mo.
Allen-Bradley Co., Milwaukee, Wis.
Burke Electric Co., Erie, Pa (Dynamo Charging System.)
Ideal Electric Mfg. Co., Mansfield, Ohio. (Dynamo Charging System.)
Kendrick & Davis Co., Lebanon, N. H. (Dynamo Charging System.)
E. Marcuson, New York. "Witham Charging Board".
O'Brien Electrophone Co., Hallowell, Me. (Dynamo Charging System.
Vesta Accumulator Co., Chicago, Ill. (For Charging Auto Lighting Battery.)
CHARGING RHEOSTATS. See Rheostats; also Stage Dimmers.
CHEMICALS, Battery.
Battery Salts, Blue Vitriol, Manganese, Sal-ammoniac.
American Electrical Works, Phillipsdale, R. I.
Western Electric Co., New York.
M. L. Barrett & Co., Chicago, Ill. (Sal-ammoniac only.)
Black Chemical Co., New York ("Electrical" Sal Ammoniac.)
Charles Cooper & Co., New York
Edward E. Cary, New York (Importers.)
Eimer & Amend, New York.
French Battery & Carbon Co., Madison, Wis. (Importers.)
Grasselli Chemical Co., Cleveland, Ohio.
F. H. Kalbfleisch Co., New York
A. Klipstein & Co., New York.
Merck & Co., New York.
Powers-Weightmann-Rosengarten Co., Philadelphia, Pa. "Veltak".
Roessler & Hasslacher Chemical Co., New York. "Battery Brand".
Charles E. Sholes Co., New York
S. S. White Dental Mfg. Co., Philadelphia, Pa. "Parts" Sulpho-Chromic Salt.
CHOKE COILS.
A. & J. M. Anderson Mfg. Co., Boston, Mass.
Delta-Star Electric Co., Chicago.
General Electric Co., Schenectady, N. Y.
Metropolitan Engineering Co., New York City.
Schweitzer & Conrad, Inc., Chicago.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Electric Service Supplies Co., Philadelphia, Pa.
Hickey & Schneider, New York.
Lord Mfg. Co., New York. (Auto-Discharge Vertical Unit.)

CHOPPERS, Meat.
See Meat Choppers, Electric.
CHRISTMAS TREE OUTFITS.
See Decorative Lighting.
CHRONOGRAPHS. See Time Stamps.
CHURNS. See Dairy Apparatus.
CIGAR LIGHTERS.
General Electric Co., Schenectady, N. Y.
Metal Specialties Mfg. Co., Chicago, Ill. "Presto".
Pittsburg Electric Specialties Co., Pittsburgh, Pa.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Adjustable Lighter Co., Newton, Mass. "Universal".
American Ever Ready Co., New York. "Every Ready"
Carstarphen Electric Co., Denver, Colo.
[illegible] Cowles & Co., New Haven, [illegible]
Eldred Mfg. Co., Chicago, Ill. "Wizard"
Mellon Electric Co., Newark, N.J.
CIRCUIT BREAKERS, Automatic.
[illegible]-Smithburg Electric Co., Inc., Chicago.
Conduit Electrical Mfg. Co., Boston, Mass.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Cutter Co., Philadelphia, Pa. "Bolte" "Type".
Electric Controller & Mfg. Co., Cleveland.
Fort Wayne Electric Works, Fort Wayne, Ind.
General Electric Co., Schenectady, N. Y.
Industrial Controller Co., Milwaukee, Wis.
Roller-Smith Co., New York City. "Standard." "Industrial."
Sundh Electric Co., New York.
Ward Leonard Electric Co., Bronxville, N.Y.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Hickey & Schneider, New York, N. Y.
CLAMPS, Cable Supporting.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
Delta-Star Electric Co., Chicago, Ill.
Electrical Engineers Equipment Co., Chicago, Ill.
General Devices & Fittings Co., Chicago, Ill.
Standard Underground Cable Co., Pittsburgh, Pa.
Western Electric Co., New York.
Diamond Expansion Bolt Co., New York. "Long Saut".
Electric Service Supplies Co., Philadelphia, Pa. (Porcelain Clamp Insulator.)
Hallett Iron Works, Harvey, Ill.
W. N. Matthews & Bro., St. Louis, Mo. "Matthews".
Paragon Electric Co., Chicago, Ill.
Special Device Co., Cincinnati, Ohio. "Bierce".
CLAMPS, Ground Connection.
See Ground Clamps.
CLAMPS, Guy.
See Guy Clamps.
CLAMPS, Insulator.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
Delta-Star Electric Co., Chicago.
Electrical Engineers Equipment Co., Chicago, Ill.
General Devices & Fittings Co., Chicago, Ill.
States Co., Hartford, Conn.
Steel City Electric Co., Pittsburgh, Pa. "Universal".
Clark Electric & Mfg. Co., New York.
Fairmount Electric & Mfg. Co., Philadelphia, Pa.
Fletcher Mfg. Co., Dayton, Ohio.
[illegible] Mfg. Co., Toledo, Ohio.
Mathew Lanz & Sons, Pittsburgh, Pa.
CLAMPS, Outlet Box.
See also Conduit Fittings.
Federal Sign System (Electric), Chicago, Ill.
CLAMPS, Splicing.
See Splicing Clamps.
CLAMPS, Test.
See Test Clamps.
CLEANERS, Boiler Tube
Elliott Co., Pittsburgh, Pa.
General Specialty Co., Buffalo, N. Y. "Demon".
Liberty Mfg. Co. Pittsburgh, Pa.
Ohio Steam Specialty Co., Youngstown, O. "Hydraulic"
Wm. B. Pierce Co., Buffalo, N. Y.
CLEANERS, GLASSWARE.
Myralite Co., Pownal, Vermont.
CLEANERS AND POLISHERS, Floor. See Floor Cleaners and Polishers.
CLEANERS, Ine. Lamp.
See Changers.
CLEANERS, Switchboard.
United Electric Co., Canton, Ohio. "Ture".
CLEANERS, Vacuum. See Vacuum Cleaners.
CLEATS, Conduit.
Diamond Mfg. Co., Detroit, Mich.
H. Wolff Mfg. Co., Chicago, Ill.
CLEATS, Fibre.
Chase Signal & Mfg. Co., Boston, Mass.
General Electric Co., Schenectady, N. Y.
Western Electric Co., New York.
CLEATS, Insulating.
Benanning Mfg. Co., Garfield, N. J.
Mineraliac Electric Co., Chicago.
CLIMBERS, Linemen's.
Cincinnati Tool Co., Cincinnati, Ohio. "Hargrave".
Klein & Sons, Mathias, Chicago.
Oshkosh Mfg. Co., Oshkosh, Wis. "Roberts".
Smith & Hemenway Co., New York. "Neverturn".
Western Electric Co., New York.
Blakeslee Forging Co., Plantsville, Conn. "Donnelly".
Cronk & Carrier Mfg. Co., Elmyra, N. Y., "Sure Grip".
Dicke Tool Co., Downers Grove, Ill.
P. Lawentraut Mfg. Co., Newark, N. J.
John J. Reidy, New Haven, Conn.
St. Johnsbury Tool Works, St. Johnsbury, Vt. "Vermont".
Wilmot Stephens, Binghamton, N. Y.
CLIPPERS, Horse. Motor Driven.
Kimble Electric Co., Chicago, Ill.
American Shearer Mfg. Co., Nashua, N. H. "Priest".
Chicago Flexible Shaft Co., Chicago, Ill.
Coates Clipper Mfg. Co., Worcester, Mass.
Gillette Clipping Machine Co., New York.
[illegible] & Co., New York. (Groomers.)
I. F. Packer & Sons LaGrange, Ill.
Reliable Electric Co., Chicago.
Taber Pump Co., Buffalo, N. Y. (Groomers.)
CLIPS, Cable. See Cable Hangers.
CLOCKS, Alarm. Electric.
Manhattan Electrical Supply Co., New York.
Stanley & Patterson, New York. "Diamond".
Betts & Betts Corp., New York City.
Darche Mfg. Co., Chicago, Ill. "Fine Light".
Partrick, Carter & Wilkins Co., Philadelphia, Pa.
Western Clock Mfg. Co., La Salle, Ill.
CLOCKS, Electric, Self Winding, Program.
Western Electric Co., New York.
American Watchman's Time Detector Co., New York.
Betts & Betts Corp., New York City.
Engineering Electric Mfg. Co., Stamford, Conn.
Frick Clock Co., Waynesboro, Pa.
H. Gillette & Co., Chicago, Ill. (Secondary Clock System.)
E. Howard Clock Co., Boston, Mass.
Imperial Clock Co., St. Louis, Mo.
Industrial Instrument Co., Foxboro, Mass.
International Time Recording Co. of New York, Endicott, N. Y. "Dey", "Bundy", "Hansen".
Magneta Co., New York.
Monarch Telephone Mfg. Co., Chicago, Ill. (Time Service System in Connection with Telephone Service.)
New York Standard Watch Wks., Jersey City, N. J.
Prentiss Clock Improvement Co., New York.
Standard Electric Time Co., Waterbury, Conn.
CLOCKS, Watchmen's.
Manhattan Electrical Supply Co., New York, N. Y.
American Watchman's Time Detector Co., New York.
Edwards & Co., New York, N. Y.
E. A. Hamilton & Co., Grand Rapids, Mich. "Waggoner".
E. O. Hausburg, New York.
Holtzer-Cabot Electric Co., Brookline, Mass.
E. Howard Clock Co., Boston, Mass.
E. Imhauser & Co., New York.
Industrial Inst. Co., Foxboro, Mass.
Robert Kopp., New York.
Nanz Clock Co., New York. (Importers "Hahn".)
National Time Recorder Co., Chicago, Ill. "Twentieth Century".
Newman Clock Co., Chicago, Ill.
Riggs & Bro., Philadelphia, Pa.
Simplex Time Recorder Co., Gardner, Mass.
Sohm Electric Signal & Recording Co., Chicago, Ill.
Watchman's Clock & Supply Co., New York.
CLOTH CUTTERS. See Cutters.
CLOTH, Insulating.
Chicago Mica Co., Valparaiso, Ind. "Champion".
Mica Insulator Co., New York. "Empire".
Packard Electric Co., Warren, O.
Standard Paint Co., New York. "P. & B.".
Standard Underground Cable Co., Pittsburgh, Pa.
Star Mica Mining Co., Inc., Canaan, N. H.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
American Mfg. Co., Newton Lower Falls, Mass., "Puritan".
Walpole Tire & Rubber Co., Walpole, Mass.
Pittsburgh Insulating Co., Pittsburgh, Pa.
Schenectady Llonite Co., Schenectady, N. Y.
Sterling Varnish Co., Pittsburgh, Pa.
CLOTHES WASHERS.
See Washers.
CLUSTERS, (Socket combinations Alone.)
Benjamin Electric Mfg. Co., Chicago.
Faries Mfg. Co., Decatur, Ill.
General Electric Co., Schenectady, N. Y.
McGill Mfg. Co., Valparaiso, Ind.
Dale Co., New York.
CLUSTER UNITS. (Lighting Fixtures with Reflectors over Clusters.)
Benjamin Electric Mfg. Co., Chicago, Ill. "Anti-Night".
Central Electric Co., Chicago, Ill.
Delta-Star Electric Co., Chicago.
Federal Sign System (Electric), Chicago, Ill.
H. W. Johns-Manville Co., New York, N. Y.
Line Material Co., South Milwaukee, Wis.
McGill Mfg. Co., Valparaiso, Ind. "Harter".
Western Electric Co., New York. "Hawthorn".
American Arc Lamp Co., Kalamazoo, Mich.
Boyse-Carmichael Mfg. Co., Chicago, Ill.
Harter Elec. Co., Chicago, Ill. (Tungsten.)
Luminous Unit Co., St. Louis, Mo.
National Stamping & Elec. Wks., Chicago, Ill.
G. E. Painter, Baltimore, Md. (For signaling trolley cars.)
W. W. Partridge Co., Chicago, Ill.
Phelps Mfg. Co., Detroit, Mich.
Philadelphia Electric Mfg. Co., Philadelphia, Pa.
States Electric Co., Chicago.
Tilden Saw & Mfg. Co., Wyandotte, Mich. "Mazda Arc".
Wheeler Reflector Co., Boston.
CLUTCHES, Magnetic.
Cutler-Hammer Clutch Co., Milwaukee, Wis.
Industrial Controller Co., Milwaukee, Wis.
Minneapolis Steel & Machinery Co., Minneapolis, Minn.
COAL HANDLING MACHINERY.
(See also Conveyors; also Scales.)
Sprague Electric Works, New York.
C. W. Hunt Co., W. New Brighton, N. Y.
Jeffrey Mfg. Co. Columbus, Ohio.
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.
COAL MINING MACHINERY.
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
COFFEE MILLS, Electric.
See Mills, Coffee.
COIL FORMING DEVICES. (For making armature coils.)
Comstock & Co., Wilkesbarre, Pa.
Electrical Mfrs. Equipment Co., Chicago.
Exeter Machine Works, Pittston, Pa.
COILS, Armature and Field.
Belden Mfg. Co., Chicago, Ill.
Crocker-Wheeler Co., Ampere, N. J.
D & W Fuse Co., Providence, R. I.
General Electric Co., Schenectady, N. Y.
John A. Roebling's Sons Co., Trenton, N. J.
American General Trading Co., New York. "A. G. E."
Boiler Insulated Wire Co., Chicago.
Chattanooga Armature Works, Chattanooga, Tenn.
Cleveland Armature Wks., Cleveland, Ohio.
Cross Electric Co., Hoboken, N. J.
Dittrick & Jordan Electric Co., Cleveland, Ohio.
Doubleday-Hill Elec. Co., Pittsburgh, Pa.
Columbia Machine Works & Malleable Iron Co., Brooklyn, N. Y.
S. K. Elliott Elec. Co., Cleveland, Ohio.
Elliott-Thompson Electric Co., Cleveland, Ohio.
Illinois Electrical Mfg. Co., Peoria, Ill.
Keokuk Armature Works, Keokuk, Iowa.
Oliver Electric & Machine Co., Birmingham, Ala.
Frank Ridlon Co., Boston, Mass.
Stimple & Ward Co., Pittsburgh, Pa.
S. J. Stewart, New Orleans, La.
COILS, Choke. See Choke Coils.
COILS, Wound, Induction, Ignition, Gas Lighting, Spark, Magnet.
Acme Wire Co., New Haven, Conn.
American Electrical Works, Philadelphia, R. I.
Belden Mfg. Co., Chicago, Ill.
D & W Fuse Co., Providence, R. I.
General Electric Co., Schenectady, N. Y.
Kellogg Switchboard & Supply Co., Chicago, Ill.
Manhattan Electrical Supply Co., New York. "Mesco".
W. R. Ostrander & Co., New York.
Stanley & Patterson, New York. "Patterson". (Screw Top.)
Western Electric Co., New York. "Hawthorn".
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Auto Coil Co., Jersey City, N. J. "Owners". "Jumphlame".
Boiler Insulated Wire Co., Chicago.
J. H. Bunnell & Co., New York.
Connecticut Telephone & Electric Co., Meriden, Conn.
Dayton Electrical Mfg. Co., Dayton, Ohio. "Apple".
Dow Mfg. Co., Braintree, Mass.
Duplex Coil Co., Fond du Lac, Wis.
Electric Goods Mfg. Co., Canton, Mass. "Perfex".
Electro Importing Co., New York.
H. P. Engeln & Co., Cleveland, Ohio.
Holtzer-Cabot Electric Co., Brookline, Mass.
International Brass & Elec. Co., New York, N. Y.
Kelly-Koett Mfg. Co., Covington, Ky.
Knoblock-Heideman Mfg. Co., South Bend, Ind.
Lemke Electric Co., Milwaukee, Wis. "L. B."
Lindsley-Allen Electrical Co., Providence, R. I. ("Paracoil" Spark and "Solocoil" Induction.)
Menominee Electric Mfg. Co., Menominee, Mich.
Wm. Meyer Co., Chicago, Ill.
National Coil Co., Lansing, Mich. "Capitol".
New York Coil Co., New York. "Fire Ball", "Economic".
C. Noxon Per Lee, Syracuse, N. Y.
Partrick, Carter & Wilkins Co., Philadelphia, Pa.
Fred'k Pearce Co., New York.
Pfanstiehl Electric Laboratory, North Chicago, Ill. (X-ray.)
Pittsfield Spark Coil Co., Dalton, Mass.
P. R. Mfg. Co., Detroit, Mich.
Queen-Gray Co., Philadelphia, Pa.
Roentgen Mfg. Co., Philadelphia, Pa. "Jumbo".
W. A. Russell & Co., New York.
Scheidel-Western X-Ray Coil Co., Chicago, Ill.
Schug Electric Mfg. Co., Detroit, Mich.
Seidler-Miner Electric Co., Detroit, Mich.
C. F. Splitdorf Co., New York.
Standard Tel. Mfg. Co., Portsmouth, Ohio.
Thordarson Electric Mfg. Co., Chicago, Ill.
Tritt Electric Co., Union City, Ind.
Victor Electric Co., Chicago, Ill. "Wantz".
Wappler Electric Mfg. Co., New York. "Tesla" (Medical.)

Williams, E. Q., Syracuse, N. Y
Witherbee Igniter Co., Springfield, Mass.

COILS, Resistance.

Badt-Westburg Electric Co., Inc., Chicago.
Belden Mfg. Co., Chicago, Ill.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Leeds & Northrup Co., Philadelphia, Pa.
Roller-Smith Co., New York.
Ward Leonard Electric Co., Bronxville, N.Y.
Western Electric Co., New York.
Boller Insulated Wire Co., Chicago.
J. H. Bunnell & Co., New York.
W. & L. E. Gurley, Troy, N. Y. "Decade".
International Brass & Electric Co., New York.
Kellogg Switchboard & Supply Co., Chicago, Ill.
Partrick, Carter & Wilkins Co., Philadelphia, Pa.
Queen-Gray Co., Philadelphia, Pa.
Thordarson Electric Mfg. Co., Chicago, Ill.

COIL, Spark. See Coils, Induction.

COLOR CAPS. See Caps.

COLORING (For Incandescent Lamps.)

L. B. Allen Co., Chicago, Ill.
McGill Mfg. Co., Valparaiso, Ind. "Crescent".
Universal Electric Stage Lighting Co., New York. "Signaloid", "Kliegl Bros."
M. L. Barrett & Co., Chicago, Ill.
Brunner Chemical Works, Cincinnati, Ohio. "Queen".
Celluloid Zapon Co., New York.
Egyptian Lacquer Mfg. Co., New York
C. E. Franche & Co., Chicago, Ill. "Permacolor".
Lacquer Radiant Co., Philadelphia, Pa. "L. R. C."

COLOR-MATCHING OUTFITS.

General Electric Co., Schenectady.

COMBUSTION RECORDERS.

See Recorders.

COMEALONGS (Wire Stretchers).

Mathias Klein & Sons, Chicago, Ill. "Landee's", "Samson", "American Grip", "Chicago Grip", "Haven's".
Rittenhouse Co., A. E., Honeoye Falls, N. Y.
Smith & Hemenway Co., New York.
Western Electric Co., New York. "Buffalo Grip".
Burr Mfg. Co., Cleveland, Ohio.
Dicke Tool Co., Downers Grove, Ill.
Eureka Tempered Copper Works, North East, Pa. "Westfield", "Parallel".
Lamson & Sessions Co., Cleveland, Ohio. "Bull Dog".
C. L. Sawyer, Miller's Falls, Mass. "Hercules" (Wire Stretcher.)
Union Electric Mfg. Co., Pekin, Ill. "Never Slip".

COMMUTATOR LUBRICANTS.

L. B. Allen Co., Chicago, Ill. "The Allen".
Joseph Dixon Crucible Co., Jersey City, N. J.
Le Valley Vitae Carbon Brush Co., New York. "Gold Medal".
McGill Mfg. Co., Valparaiso, Ind. "Star".
K. McLennan & Co., Chicago, Ill. "Gale's".
Western Electric Co., New York.
James Goldmark Co., New York. "Trotter's".
International Acheson Graphite Co., Niagara Falls, N. Y.
Mortimer Du Perow Electric Co., Washington, D. C. "Deco".
G. W. Fowler & Co., North Tonawanda, N. Y. "Niagara".
Hart & Co., Fostoria, Ohio. "Red Cross".
Onward Mfg. Co., Menasha, Wis.
J. F. Walsh Co., Pittsfield, Mass. "Anti-Spark."
Warren Lubricant Co., Buffalo, N. Y. "Perfecto", "Sanderson", "Spermo", "Consistency".

COMMUTATOR REPAIR CEMENT.

E. E. Early Co., Canton, Ohio.
Pias-Mica Co., Yonkers, N. Y.

COMMUTATOR BARS & SEGMENTS.

General Electric Co., Schenectady.
Western Electric Co., New York.
Billings & Spencer Co., Hartford, Conn.
Eureka Tempered Copper Works, North East, Pa.

COMMUTATOR TRUING DEVICES.

Fort Wayne Electric Works, Fort Wayne, Ind.
General Electric Co., Schenectady, N. Y.
Jordan Bros., New York, N. Y.

COMMUTATORS.

Western Electric Co., New York.
American General Trading Co., New York. "A. G. E."
A. B. Black Road Machinery Co., Boston, Mass. "Climax".
Cleveland Armature Works, Cleveland, Ohio.
Columbia Machine Works & Malleable Iron Co., Brooklyn, N. Y.
Doubleday-Hill Elec. Co., Pittsburg, Pa.
Eureka Tempered Copper Works, North East, Pa.
Forsyth Electric Co., Seattle, Wash.
Homer Commutator Co., Cleveland, Ohio.
F. H. Lovell & Co., Arlington, N. J. (Automobile.)
Frank Ridlon Co., Boston, Mass.
S. J. Stewart, New Orleans, La.

COMPOSITION. See Insulation, also Line Material.

COMPOUNDS, Boiler Cleansing.

Dearborn Chemical Co., Chicago.
H. W. Johns-Manville Co. New York, N. Y.

COMPOUNDS, Commutator.

See Commutator Lubricants.

COMPOUNDS, Impregnating.

See Varnish.

COMPOUNDS, Insulating.

See Insulating Paints.

COMPOUNDS, Splicing.

See Tape.

COMPRESSORS, Air.

See Air Compressors.
(For small sizes, see Brushes, Pneumatic.)

CONDENSERS, Electric.

Leeds & Northrup Co., Philadelphia, Pa.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Automatic Electric Co., Chicago, "Raven" brand.
Ericsson Mfg. Co., Buffalo, N. Y.
Marconi Wireless Telegraph Co., New York, N. Y.
Wm. Marshall, New York, N. Y.
Queen-Gray Co. Philadelphia, Pa.
Storm, Francis, New York. (Copper plated.)
Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y.

CONDENSERS, Steam.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Chicago.
Westinghouse Mach. Co., Pittsburgh, Pa.

CONDUCTORS, Armored.

See Cables.

CONDUIT, Flexible.

Alphaduct Co., Jersey City, N. J.
American Circular Loom Co., New York City.
American Conduit Mfg. Co., Pittsburgh, Pa. "Wireduct" Flexible Non-Metallic.
Central Electric Co., Chicago, Ill.
National Metal Molding Co., Pittsburgh, Pa. "Flexsteel" (Metallic). "Flexduct" (Non-metallic).
Sprague Electric Works, New York. "Greenfielduct" Flexible Metallic.
Tubular Woven Fabric Co., Pawtucket, R. I.
Western Electric Co., New York.
Eastern Flexible Conduit Co., Brooklyn, N. Y. ("Brookduct" Non-Metallic Flexible.)
Safety-Armorite Conduit Co., Pittsburgh, Pa. "Sterling".
Trenton Electric & Conduit Co., Trenton, N. J. (Steel Armored Only.)

CONDUIT, Interior (Rigid).

American Circular Loom Co., New York City.
American Conduit Mfg. Co., Pittsburgh, Pa. "Galvanite" and "American."
Central Electric Co., Chicago, Ill.
Clifton Mfg. Co., Jamaica Plain, Boston, Mass. "Clifton."
Enameled Metals Co., Pittsburgh, Pa. (Pittsburgh Standard," "Pittsburgh Standard Galvanized.")
National Metal Molding Co., Pittsburgh, Pa. "Flexsteel" "Sherarduct" "Economy" "Ovalduct."
Sprague Electric Wks., New York. "Greenfielduct" Rigid.
Western Conduit Co., Youngstown, Ohio. "Buckeye."
Western Electric Co., New York.
Central Tube Co., Pittsburgh, Pa. "Central White," "Central Red," "Central Black."
Greenfield Conduit Co., Steubenville, Ohio. "Greenfielduct."
Mark Mfg. Co., Chicago, Ill. ("Navalite," "Zinkote.")
National Enameling & Mfg. Co., Youngstown, Ohio ("Enamelduct." "Armyduct," "Alumaduct," "Alumaduct Special.")
Pittsburg Conduit Co., Pittsburgh, Pa. ("Alumaduct" and "Armaduct" Rigid.)
Safety Armorite Conduit Co., Pittsburgh, Pa. "Loricated", "Armorduct," "Galvaduct."

CONDUIT, Underground, Clay, Composition, Fibre, Wood.

American Conduit Co., East Chicago, Ind. (Bitumenized Fibre.)
H. B. Camp Co., New York. "Camp-Duct".
Fibre Conduit Co., Orangeburg, N. Y.
H. W. Johns-Manville Co., New York. ("J. M." Fibre.)
McRoy Clay Works, Chicago.
American Sewer Pipe Co., Akron, Ohio.
American Vitrified Conduit Co., New York.
Brazil Hollow Brick & Tile Co., Brazil, Ind.
Chicago Stone Conduit Co., Chicago, Ill. "Stoneduct."
Clay Product Co., Chicago, Ill.
Clermont Sewer Pipe Co., New York.
Denny-Renton Clay & Coal Co., Seattle, Wash.
W. S. Dickey Clay Mfg. Co., Kansas City, Mo.
Evans, Almiral Co., Chicago.
Grand Ledge Clay Products Co., Grand Ledge, Mich.
Michigan Pipe Co., Bay City, Mich. (Wood.)
N. Y. State Sewer Pipe Co., Rochester, N. Y.
Norfolk Creosoting Co., Norfolk, Va. (Creosoted Wood.)
Rochester Sewer Pipe Co., Rochester, N. Y.
Standard Sewer Pipe Co., Rochester, N. Y.
Standard Vitrified Conduit Co., New York.
Wyckoff Pipe & Creosoting Co., New York. (Creosoted Wood.)

CONDUIT BENDERS.

See Benders.

CONDUIT ENGINEERS & CONTRACTORS.

Gest, G. M., New York, N. Y.
Graner-Mahoney Contracting Co., St. Louis, Mo.
Turner Improvement Co., J. W., Des Moines, Iowa.

CONDUIT FISHING MACHINES.

See Fishing Machines.

CONDUIT RODS.

(And Couplings for same.)

Bissell Co., F., Toledo, O. "Security".
Standard Underground Cable Co., Pittsburgh, Pa. "Empire" Duct Rods.
Western Electric Co., New York.
Harold L. Bond Co., Boston, Mass.
Chicago Conduit Rod Coupling Co., Chicago, Ill.
Cleverly Elec. Works, Philadelphia, Pa.
Diamond Expansion Bolt Co., New York. "Empire".
Kinsey Mfg. Co., Toledo, Ohio.
Meckel, Fred L., Chicago, Ill.

CONNECTORS, Automobile Wire.

General Electric Co., Schenectady, N. Y.
National Metal Molding Co., Pittsburgh, Pa. "Autoflex".
J. Alexander Co., New York.
Chicago Electric Mfg. Co., Chicago, Ill. "Handy".
Frank W. Morse Boston, Mass
H. B. Sherman Mfg. Co., Battle Creek, Mich.

CONNECTORS, Battery.

Belden Mfg. Co., Chicago, Ill.
Delta-Star Electric Co., Chicago.
Faries Mfg. Co., Decatur, Ill.
General Electric Co., Schenectady, N. Y.
Manhattan Electrical Supply Co., New York. "Sta-There," "Mesco".
National Carbon Co., Cleveland, Ohio.
Stackpole Carbon Co., St. Marys, Pa. "Mills".
Western Electric Co., New York.
America Ever Ready Co., New York. "Bull Dog".
Barcy-Nicholson Co., Detroit, Mich.
Beck Co., Rockville Centre, N. Y.
Bliss-Chester Co., Providence, R. I. "Duplex".
W. Wood Carlisle, Buffalo, N. Y "Ever Best".
Lemke Electric Co., Milwaukee, Wis. "L. B."
C. K. Connector Co., Worcester, Mass.
Oliver Electric & Mfg. Co., St. Louis, Mo.
Simplex Auto Specialty Co., Detroit, Mich. "Perfecto", "Simplex".
Tregoning Electric Mfg. Co., Cleveland, Ohio. "Lobster Claw".

CONNECTORS, Box and Cabinet.

Appleton Electric Co., Chicago, Ill. "No-Thread".
Delta-Star Electric Co., Chicago, Ill.
Faries Mfg. Co., Decatur, Ill.
National Metal Molding Co., Pittsburgh, Pa. "Autoflex".
Sprague Electric Works, New York.
Thomas & Betts Co., New York. "T. & B."
Universal Electric Stage Lighting Co., New York, N. Y. "Kliegl Bros."
W. A. Bonnell Co., New York.
Wm. S. Brown Electric Co., New York.
H. B. Sherman Mfg. Co., Battle Creek, Mich.
Standard Electric Fittings Co., Stamford, Conn.

CONNECTORS, Copper Wire. Splicing.

Appleton Electric Co., Chicago.
Belden Mfg. Co., Chicago, Ill.
Chicago Fuse Mfg. Co., Chicago.
Dossert & Co., New York. (Solderless.)
Electric Controller & Mfg. Co., Cleveland, O.
Electrical Engineers Equipment Co., Chicago, Ill. (T-Split.)
Fargo Mfg. Co., Inc., Poughkeepsie, N. Y.
General Devices & Fittings Co., Chicago, Ill.
General Elec. Co., Schenectady, N. Y.
Manhattan Electrical Supply Co., New York.
Metropolitan Engineering Co., New York City.
Ohio Brass Co., Mansfield, Ohio.
W. R. Ostrander & Co., New York.
Trumbull Electric Mfg. Co., Plainville, Conn.
U. S. E. M. Co., New York City. ("USEM".)
Western Electric Co., New York.
Automatic Electric Co., Chicago
Bryant Zinc Co., Chicago, Ill ("Premier" Sleeve.)
J. H. Bunnell & Co., New York
Central Machinery and Supplies Co., New York City.
Chicago Nut Co., Chicago, Ill.
Clark Electric & Mfg. Co., New York. (Sleeve.)
Fairmount Electric & Mfg. Co., Philadelphia, Pa. "Alligator" "H. W. W."
Frank B. Cook, Chicago, Ill.
Fort Dearborn Mfg. Co., Chicago Ill. "Zeno".
Harvard Electric Co., Chicago Ill. (Sleeve.)
Hickey & Schneider, New York. N. Y.
Holtzer-Cabot Electric Co., Brookline, Mass.
H. Krantz Mfg. Co., Brooklyn, N. Y. (Sleeve.)
C. McIntyre Co., Newark, N. J
Morriseff Elec. Mfg. Co., New York City. "Nosplice."
Frank W. Morse, Boston, Mass "Eureka"
National Electric Specialty Co., Toledo, Ohio. ("Ritetite" Self Soldering.)
National Telephone Supply Co. Cleveland, Ohio. (Sleeve.)
Philadelphia Electric Mfg. Co., Philadelphia, Pa.
Reliable Electric Co., Chicago Ill. (Sleeve.)
Frank Ridlon Co Boston, Mass
H. B. Sherman Mfg. Co., Battle Creek, Mich.
Sibley & Pitman, New York "Climax."
John J. Waldman, New York. N. Y.
Waterbury Mfg. Co., Waterbury, Conn.
Yonkers Specialty Co., Yonkers, N. Y. "New York".

CONNECTORS, Stage.

Universal Electric Stage Lighting Co., New York. "Kliegl Bros."

CONSTRUCTION, Engineering.

Arnold Co., The, Chicago, Ill.

Bylleaby & Co., H. M., Chicago, Ill.
Ford, Bacon & Davis, New York.
New England Engineering Co., New York, N. Y.
Stone & Webster Eng. Corp., Boston, Mass.
White Companies, J. G., New York, N. Y.
Woodmansee & Davidson, Inc., Chicago.

CONTROLLERS, Current.

(See Rheostats; Controllers, Printing Press, Auto-Starters.)

CONTROLLERS, Flat Rate.

Excess Indicator Co., Pittsburgh.
Henry Thermo-Electric Co., Newport, Vt.

CONTROLLERS, Printing Press.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Crocker-Wheeler Co., Ampere, N. J.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Industrial Controller Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.
Allen-Bradley Co., Milwaukee, Wis.
Monitor Controller Co., Baltimore, Md.
Union Electric Mfg. Co., Milwaukee, Wis.

CONTROLLER, Regulators.

See Rheostats, Motor Controlling.

CONVERTERS, Rotary.

See Rectifiers.
Fairbanks, Morse & Co., Chicago.
Northwestern Electric Co., Chicago.

CONVEYORS, Coal.

Fairbanks, Morse & Co., Chicago.
Aultman Co., Canton, Ohio.
C. O. Bartlett & Snow Co., Cleveland, Ohio.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Buhl Malleable Co., Detroit, Mich.
Darley Engineering Co., New York. ("Suction" Ashes conveyor.)
Exeter Machine Works, Pittston, Pa. "Le Grand".
M. Garland Co., Bay City, Mich.
C. W. Hunt Co., West New Brighton, N. Y. "Noiseless Gravity".
Interstate Engineering Co., Cleveland, Ohio.
Jeffrey Mfg. Co., Columbus, Ohio.
Link-Belt Co., Philadelphia, Pa. "Peck"
Mead-Morrison Mfg. Co., Cambridge, Mass. "McCaslin", "Harrison's".
Minneapolis Steel & Machinery Co., Minneapolis, Minn.
Robins Conveying Belt Co., New York.
P. H. & F. M. Roots, Connersville, Ind.
Skillin & Richards Mfg. Co., Chicago, Ill.
Steel Cable Engineering Co., Everett, Mass.
Webster Mfg. Co., Chicago, Ill.

COOKERS, Fireless Electric.

Automatic Electric Cook Co., Toronto, Ont., Fireless Cookers.
Cadillac Electric Mfg. Co., Cadillac, Mich.
The Standard Electric Stove Co., Toledo, Ohio.
Electric Fireless Cookstove Co., Buchanan, Mich. ("Favorite", "Ideal" and "Model".)
Good Housekeeping Cooker Co., Berkeley, Cal. "Good Housekeeping".
Phelps Mfg. Co., Detroit, Mich.

COOKING DEVICES, Electric.

Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Despatch Mfg. Co., Minneapolis, Minn.
Federal Sign System (Electric), Chicago, Ill. (Kitchen Cabinets.)
General Electric Co., Schenectady, N. Y.
Globe Stove & Range Co., Kokomo, Ind.
Hughes Electric Heating Co., Chicago, Ill.
Manhattan Electrical Supply Co., New York.
Rutenber Electric Co., Logansport, Ind.
Simplex Electric Heating Co., Cambridge, Mass.
Western Electric Co., New York.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
American Electrical Heater Co., Detroit, Mich.
Cadillac Electric Mfg. Co., Cadillac, Mich.
Copeman Electric Stove Co., Flint, Mich.
Pelouse Mfg. Co., Chicago.
The Standard Electric Stove Co., Toledo, Ohio.
Helion Electric Co., Newark, N. J.
Hoskins Mfg. Co., Detroit, Mich. (Toasters.)
Hot Point Electric Heating Co., Ontario, Calif. ("El Tosto" Toaster, "Utility Hot Point" Sad Irons.)
International Instrument Co., Cambridge, Mass. (Electric Ovens.)
Phelps Mfg. Co., Detroit, Mich. ("Cozy" Toaster.)
Albert Pick & Co., Chicago. (Cooking Ranges.)
Simplex Electric Heating Co., Cambridge, Mass.
Sternau & Co., Brooklyn, N. Y.
Thermo Mfg. Co., Cleveland, Ohio. (Fireless Cooker and Oven.)

COPPERS, Battery.

Manhattan Electric Supply Co., New York, N. Y.
Stanley & Patterson, New York. "Greeley".
Western Electric Co., New York.
Beattie Zinc Works Co., Reading, Mass.
Bryant Zinc Co., Chicago, Ill.
Edes Mfg. Co., Plymouth, Mass.
Grasselli Chemical Co., Cleveland, Ohio.

CORD ADJUSTERS.

See Adjusters.

CORD, Braided, Arc Lamp Ropes, Arc Lamp Chain.

Samson Cordage Works, Boston, Mass.
Western Electric Co., New York.
J. E. Fricke & Co., Philadelphia, Pa. "Jefferson".
International Register Co., Chicago, Ill.
Oneida Community, Oneida, N. Y. (Chain Only.)
Silver Lake Co., Boston, Mass.

CORD, Flexible.

See Wire, Rubber Covered.

CORD, Telephone (Flexible).

American Electrical Works, Philipsdale, R. I.
Belden Mfg. Co., Chicago, Ill.
Driver-Harris Wire Co., Harrison, N. J.
Kellogg Switchboard & Supply Co., Chicago, Ill.
Alfred F. Moore, Philadelphia, Pa.
Western Electric Co., New York.
Chicago Insulated Wire & Mfg. Co., Chicago.
C. H. McEvoy, Lowell, Mass. "Duro".
Premier Electric Co., Chicago.
Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y.

COTTON (Insulating).

See Yarn.

COUNTERS, Pole.

Benton Mfg. Co., New York.
W. N. Durant Co., Milwaukee, Wis.
International Register Co., Chicago, Ill.
New York Standard Watch Works, Jersey City, N. J.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
Standard Register Co., Chicago, Ill. "Pratts".

COUNTERS, Revolution.

Belden Mfg. Co., Chicago, Ill.
Bristol Company, Waterbury, Conn.
Esterline Co., The, Indianapolis, Ind.

COUNTING MACHINES.

National Scale Co., Chicopee Falls, Mass.

COUPLINGS AND NIPPLES, Conduit.

American Circular Loom Co., New York City.
American Conduit Mfg. Co., Pittsburgh, Pa. (Couplings.)
Appleton Electric Co., Chicago, Ill. ("No-Thread" Couplings.)
Condit Electrical Mfg. Co., Boston, Mass. ("Chase" Nipples and "Shawmut" Couplings.)
Enameled Metals Co., Pittsburgh, Pa. (Couplings.)
Farics Mfg. Co., Decatur, Ill.
National Metal Molding Co., Pittsburgh, Pa. (Couplings.)
Thomas & Betts Co., New York. "T. & B." (Erickson Couplings.)
W. A. Bonnell Co., New York.
K. & B. Co., Philadelphia, Pa. ("Ready Thread" Couplings.)
Safety-Armorite Conduit Co., Pittsburgh, Pa. "Ready Thread" Couplings.

COUPLINGS, Shaft, Insulated.

Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Chas. Bond Co., Philadelphia, Pa. "Grundy".

COVERING MACHINES, Wire.

Minneapolis Electric & Construction Co., Minneapolis, Minn.
New England Butt Co., Providence, R. I.
American Insulating Machinery Co., Philadelphia, Pa.
Farrel Fdy. & Mach. Co., Ansonia, Conn.
Rhode Island Braiding Machine Co., Providence, R. I.
C. J. Root Co., Bristol, Conn. "Roco".
John Royle & Sons, Paterson, N. J.
Textile Machine Works, Reading, Pa.
Universal Winding Co., Boston, Mass.
John J. Waldman, New York. "Jones-Perfection".

COVERS, CONDUIT BOX.

Arrow Electric Co., Hartford, Conn.
Pass & Seymour, Inc., Solvay, N. Y. ("P. & S.")
Freeman Electric Co., R. H., Trenton, N. J.

COVERS AND GUARDS, Manhole.

Bissell Co., F., Toledo, O. "Security".
Davenport Machine & Foundry Co., Davenport, Ia.
Wallace Foundry & Mach. Co., Lafayette, Ind.

COW MILKERS.

See Dairy Apparatus.

CRANES AND HOISTS.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Crocker-Wheeler Co., Ampere, N. J.
Fairbanks, Morse & Co., Chicago.
Jordan Bros., New York. (Differential Grip Hoists.)
Sprague Electric Works, New York.
American Engineering Co., Philadelphia, Pa.
American Hoist & Derrick Co., St. Paul, Minn.
American Ship Windlass Co., Providence, R. I.
Alfred Box & Co., Philadelphia.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Browning Engineering Co., Cleveland, Ohio.
Butte Engineering & Electric Co., San Francisco, Calif.
Thos. Carlin's Sons Co., Pittsburgh, Pa. (Hoists.)
Case-Crane Co., Columbus, Ohio.
Chambersburg Engineering Co., Chambersburg, Pa.
Chicago Pneumatic Tool Co., Chicago, Ill.
Chisholm & Moore Mfg. Co., Cleveland, Ohio. "Cyclone".
Cleveland Crane & Car Co., Wickliffe, Ohio. (Monorail.)
Climax Hoist Co., Philadelphia.
Curtis & Co., Mfg. Co., St. Louis.
Dobbie Foundry & Machine Co., Niagara Falls, N. Y.
Economy Engineering Co., Chicago, Ill. (Electric Tiering Machines.)
Elevator Supply & Repair Co., Chicago. (Scene and Curtain Hoists.)
E. Flory Mfg. Co., Bangor, Pa.
Franklin Portable Crane & Hoist Co., Franklin, Pa.
Edwin Harrington, Son & Co., Philadelphia, Pa.
Humphrey & Son, Joliet, Ill.
C. W. Hunt Co., West New Brighton, N. Y.
Industrial Works, Bay City, Mich.
Interstate Engineering Co., Cleveland, Ohio.
King Bridge Co., Cleveland.
Lidgerwood Mfg. Co., New York. (Hoists.)
Maine Electric Co., Portland, Me.
Maris Bros., Philadelphia, Pa.
Mead-Morrison Mfg. Co., Cambridge, Mass.
Morgan Engineering Co., Alliance, Ohio.
Northern Engineering Works, Detroit, Mich.
Otis Elevator Co., New York.
Patten Mfg. Co., Chattanooga.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Reading Crane & Hoist Works, Reading, Pa.
James H. Roberts Elevator Co., New York.
Seelar Elevator Works, Pittsburgh, Pa.
Sellers & Co., Wm., Philadelphia, Pa.
Shaw Electric Crane Co., New York.
Sheppard Electric Crane & Hoist Co., Montour Falls, N. Y.
Chas. A. Strelinger Co., Detroit, Mich.
Thomas Elevator Co. Works, Chicago, Ill.
Wellman-Seaver-Morgan Co., Cleveland, Ohio.
Whiting Foundry Equipment Co., Harvey, Ill.
Willamette Iron & Steel Works, Portland, Ore. (Electric Hoists.)
Williamson Bros. Co., Philadelphia, Pa. (Warping and Hauling Hoists.)
Yale & Towne Mfg. Co., New York.

CRANE MOTORS.

Crocker-Wheeler Co., Ampere, N. J.
Ft. Wayne Electric Works, Fort Wayne, Ind.
General Electric Co., Schenectady, N. Y.
Mechanical Appliance Co., Milwaukee, Wis.
Triumph Electric Co., Cincinnati, O.
Wagner Elec. Mfg. Co., St. Louis, Mo.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.

CREOSOTED PRODUCTS.

American Cross Arm Co., Chicago.
Southern Exchange Co., New York, N. Y.

CROOKES TUBES. See X-Ray Outfits

CROSS ARMS. (Wood.)

American Bridge Co., New York.
American Cross Arm Co., Chicago, Ill.
Bissell Co., F., Toledo, Ohio.
Humbird Lumber Co., Sandpoint, Idaho.
Lindsley Bros. Co., Spokane, Wash.
Southern Exchange Co., New York, N. Y.
Western Electric Co., New York.
W. M. Absher Co., North Wilkesboro, N. C.
Berlin Mills Co., Portland, Me (Kyanized Spruce.)
Berthold & Jennings Lumber Co., St. Louis, Mo.
Central Mfg. Co., Chattanooga, Tenn.
Cohn & Bock Co., Princess Anne, Md.
John A. Cranston Lumber Co., Wilmington, Del.
Doty Lumber & Shingle Co., Doty, Wash.
Elkin Machinery Co., Elkin, N. Car.
Ferguson Lumber Co., Little Rock, Ark.
Gulf Arm & Creosoting Co., Hattiesburg, Miss.
Kettle River Co., Minneapolis, Minn.
Louisiana Red Cypress Co., New Orleans, La.
W. S. Morse Lumber Co., Los Angeles, Calif.
Norfolk Creosoting Co., Norfolk, Va.
John L. Roper Lumber Co., Norfolk, Va.

Southern Pine Mfg. Co., Paducah, Ky.
J. B. Voncanon, West End, N. C.
A. S. Wade & Co., Shippensburg, Pa.
F. B. Williams Cypress Co., Patterson, La.
Wyckoff Pipe & Creosoting Co., New York.

CROSS ARM BRACES.
See Braces.

CROSS ARM SUPPORTS. See Supports.

CROWFEET. See Fittings, Fixtures.

CRYSTALS, Chandelier, Prisms, Beads.
Franz Euler & Co., New York, N. Y. (Importers.)
Fensterer & Ruhe, New York.
Oscar O. Friedlaender, New York.
Noe & Sons, Wm. R., New York, N. Y.
Pairpont Corp., New Bedford, Mass.
Schaffer-Flaum Co., New York.
Siegman & Weil, New York.

CUPS, Porous.
New England Pottery Co., Boston, Mass.
Robinson Clay Product Co., New York.

CURLING IRON HEATERS, Electric.
Simplex Electric Heating Co., Cambridge, Mass.

CURLING IRONS, Electric (and heaters for curling irons.)
Central Electric Co., Chicago, Ill.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Manhattan Electrical Supply Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
M. M. Buck, Franklinville, N. Y. "Her Majesty" (Coin in slot Curling Iron).
Cassady-Fairbank Mfg. Co., Chicago, Ill. (Curling Iron and Thermo Socket.)
Pelouze Mfg. Co., Chicago.
Vulcan Electric Heating Co., Buffalo, N. Y.

CUSHIONS, Field Coil.
W. N. Matthews & Bro., St. Louis, Mo.
Walpole Tire & Rubber Co., Walpole, Mass

CUT-OUTS, Enclosed Fuse, Plug, Rosette, Cut-Out Bases.
Arrow Electric Co., Hartford, Conn.
Borden Co., Warren, Ohio.
Central Electric Co., Chicago.
Chicago Fuse Mfg. Co., Chicago, Ill. "Union" fuse blocks and entrance service cut-outs.
C. & P. Electric Works, Springfield, Mass.
Commonwealth Edison Co., Chicago, Ill.
D & W Fuse Co., Providence, R. I.
Detroit Fuse & Mfg. Co., Detroit Mich.
General Electric Co., Schenectady, N. Y.
Hart Mfg. Co., Hartford, Conn.
H. W. Johns-Manville Co., New York.
Manhattan Electrical Supply Co., New York. "Mesco".
Metropolitan Engineering Co., New York City.
Multi Refillable Fuse Co., Chicago.
National Metal Molding Co., Pittsburgh, Pa.
Paiste Co., H. T., Philadelphia, Pa. "P. K." "K. W."
Pass & Seymour, Inc., Solvay, N. Y. "Little Gem".
Peru Electric Co., Peru, Ind.
Trio Mfg. Co., Rock Island, Ill.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Bryant Electric Co., Bridgeport, Conn.
Chase-Shawmut Co., Newburyport, Mass.
Conn. Elec. Mfg. Co., Bridgeport, Conn.
Crouse-Hinds Co., Syracuse, N. Y. "Norbitt."
E. H. Freeman Electric Co., Trenton, N. J. ("Freeman.")
Heinemann Co., Inc., Geo., Philadelphia, Pa.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Johns-Pratt Co., Hartford, Conn.
Mutual Elec. & Machine Co., Wheeling, W. Va.
New Haven Electric Mfg. Co., North Haven, Conn.
Perkins Elec. Switch Mfg. Co., Bridgeport, Conn.
Stewart, S. J., New Orleans, La.
Tregoning Elec. Mfg. Co., Cleveland, Ohio. "Tregoning."
Weber Elec. Co., Schenectady, N. Y.
Worcester Electric Mfg. Co., Worcester, Mass.

CUT-OUTS, Arc Light.
Brady Electric Mfg. Co., New Britain, Conn.
Geo. Cutter Co., South Bend, Ind.
Fort Wayne Electric Works, Ft. Wayne, Ind. "Wood".
General Electric Co., Schenectady, N. Y.
High Tension Electrical Specialty Co., Newton, Mass.
Metropolitan Engineering Co., New York City.
Western Electric Co., New York.
Bryant Electric Co., Bridgeport, Conn. "Bryant-Cleveland"
Electric Fuseguard Co., Newark, N. J.
Lundin Electric & Machine Co., Boston, Mass.
Philadelphia Electric Mfg. Co., Philadelphia, Pa.
Railway and Industrial Engineering Co., Pittsburgh, Pa.

CUT-OUTS, Transformer.
Central Electric Co., Chicago, Ill.
D & W Fuse Co., Providence, R. I.
Delta-Star Electric Co., Chicago. (High Voltage.)
General Electric Co., Schenectady, N. Y.
Metropolitan Engineering Co., New York City.
Pass & Seymour, Inc., Solvay, N. Y.
Pittsburgh Transformer Co., Pittsburgh, Pa.
Schweitzer & Conrad, Inc., Chicago.
Wagner Electric Mfg. Co., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Electric Fuseguard Co., Newark, N. J.
Philadelphia Electric Mfg. Co., Philadelphia, Pa.

CUTTERS, Carbon and Porcelain.
Hagstrom Bros. Mfg. Co., Lindsborg, Kans.
Lundin Elec. & Mach. Co., Boston, Mass.

CUTTERS, Cloth. (Motor Driven.)
American Electric Mach. Co., New York, "Waring".
Eastman Machine Co., Buffalo, N. Y.
Universal Cutter Co., St. Louis, Mo.
Wildman Mfg. Co., Norristown, Pa. "Ballard", "Hemafan".
Wolf Electrical Promoting Co., Cincinnati, Ohio. "Star", "Cyclone", "Bloch-Wolf".
C. E. Wright Co., Kenilworth, N. J.

CUTTERS, Pipe.
Borden Co., Warren, Ohio.

DAIRY APPARATUS (Electric).
Esterline Co., Indianapolis, Ind.
American Butter Cutting Machine Co., New York
D. H. Burrell & Co., Little Falls, N. Y. ("Simplex" Milk Testers, Churns and Butter Makers and Cow Milkers.)
Creamery Package Mfg. Co., Chicago, Ill. (Milk Testers.)
International Instrument Co., Cambridge, Mass.
John E. Low, Chicago. (Butter Cutters.)
Liberty Cow Milker Co., Hammond, Ind.
Sylvan, A. E., New York.
Weis Mfg. & Supply Co., Hammond, Ind. (Cow Milkers.)

DAMS, Movable.
American Bridge Co., New York.

DECORATIVE LIGHTING.
Central Electric Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y. (Christmas Tree Lighting Outfits.)
Manhattan Electrical Supply Co., New York. (Decorative Outfit.)
National Quality Lamp Division of General Electric Co.—The following member works:
Elux Miniature Lamp Works, New York.
Elblight System of America, New York.
Jaeger Miniature Lamp Mfg. Co., New York. ("Jaeger" Christmas Tree Lighting Outfit.)
Universal Electric Stage Lighting Co., New York. "Kliegl."

DEFLECTORS, Fan.
James Goldmark Co., New York. "Simplex."

DEMAGNETIZERS, Watch.
Boettger & Wittig, Milwaukee, Wis.
W. Green Elec. Co., New York.

DENTAL APPLIANCES.
See Medical Apparatus.

DERRICKS.
American Bridge Co., New York.

DESK FANS.
See Fans, Portable.

DESK LAMPS.
See Lights, Desk.

DETECTORS, Ground. See Instruments, Testing.

DEUPODS. See Fittings, Fixture.

DIES. See Pipe Fitting Tools.

DIE STOCKS.
Borden Co., Warren, Ohio.

DIMMERS. (See Rheostats, Stage Dimming. Also Sockets Regulating.

DIRECT MOTOR DRIVES for Planers, Etc.
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Crocker-Wheeler Co., Ampere, N. J.
Electric Controller & Mfg. Co., Cleveland, Ohio.
General Electric Co., Schenectady, N. Y.
Mechanical Appliance Co., Milwaukee, Wis.
Triumph Electric Co., Cincinnati, Ohio.
Wagner Elec. Mfg. Co., St. Louis, Mo.
Western Electric Co., New York, N. Y.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

DISCS, Armature. Iron Discs and Segments for Armatures and Transformers.
Edward E. Cary Co., New York. "Sankey".
Thomas Smith Co., Worcester, Mass.
Universal Carbon Co., Dundee, Ill.
W. & S. Mfg. Co., Worcester, Mass.

DISCONNECTORS.
See Switches, Disconnecting.

DISTRICT CALL BOXES. See Fire Alarms.

DOMES. See Shades, glass.

DOOR OPENERS & LOCKS.
Manhattan Electrical Supply Co., New York.
Western Electric Co., New York.
Edwards & Co., New York.
Francis Keil & Sons, New York. "Reliance, Jr.," "Reliance."
Huebsch, H. M., Chicago, Ill.
M. Mueller, Boston, Mass.
Standard Lock Co., Brooklyn, N. Y. "Champion," "Bull Dog."

DOOR SWITCHES, Automatic. (Operating lights by opening and closing the door.)
Arrow Electric Co., Hartford, Conn. "Arrow E."
Cutler-Hammer Mfg. Co., Milwaukee, Wis. "C. H."
Cutter Co., Philadelphia, Pa. "Daisy."
Hart Mfg. Co., Hartford, Conn. "Diamond H."
Hart & Hegeman Mfg. Co., Hartford, Conn. "H. & H."
Perkins Electric Switch Mfg. Co., Bridgeport, Conn.
Sechrist Co., Albert, Denver, Colo.

DRESSING, Commutator. See Commutator Lubricants.

DRIERS AND IMPREGNATORS. Armature, Field Coil.
Buffalo Foundry & Machine Co., Buffalo, N. Y.
J. P. Devine Co., Buffalo, N. Y. "Passburg."
N. Hubbard's Sons, Brooklyn.
F. J. Stokes Mach. Co., Philadelphia, Pa.

DRILLS AND BITS, Electricians.
Cincinnati Tool Co., Cincinnati, Ohio. "Hargrave".
Hubbard & Co., Pittsburgh, Pa. "Pierce Hammer Drill."
Kyle Boring Device Co., Alliance, Ohio.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Smith & Hemenway Co., New York.
Western Electric Co., New York.
Chicago Expansion Bolt Co., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
Daugherty, Smith, Phillips Co., Chicago.
Detroit Twist Drill Co., Detroit, Mich.
Dicke Tool Co., Downers Grove, Ill.
J. F. McCoy Co., New York, N. Y. "Osborne" Hollow Drill.
H. H. Mayhew Co., Shelbourne Falls, Mass.
Standard Tool Co., Cleveland, Ohio. (For Brick and Stone.)
Star Expansion Bolt Co., New York. ("Sebco" Hollow Drills for Brick & Stone.)
Syracuse Twist Drill Co., Syracuse, N. Y.

DRILLS, Mining.
Fort Wayne Electric Works, Fort Wayne, Ind.
Ingersoll Rand Co., New York.

DRILLS, Portable. See Tools, Portable.

DRIVES, Silent Chain.
Morse Chain Co., Ithaca, N. Y.

DRIVERS, Staple. See Staples.

DUMBWAITERS, Electric.
Burdett-Rowntree Mfg. Co., Chicago.
Geo. T. McLaughlin Co., Boston, Mass.
Otis Elevator Co., New York.

DUSTERS, Pneumatic Armature. (See Brushes, Pneumatic.)

DYNAMOMETERS. See Instruments, Testing.

DYNAMOS. See Motors and Dynamos.

ECONOMIZERS, Tungsten Lamp. See Transformers Low Voltage.

ELECTRIC HEATING DEVICES.
International Electric Co., Indianapolis, Ind.
Reimers Mfg. Co., New York City.
P. J. Electric Heating Co., Chicago, Ill.
S. W. Electric Co., New York.

ELECTRIC VEHICLES. See Automobiles, Electric.

ELECTRODES, Furnace.
National Carbon Co., Cleveland, O.
Hill-Morgan Electric Welding Machine Co., New York.
International Acheson Graphite Co., Niagara Falls, N. Y.

ELECTRO MAGNETS. See Magnets.

ELECTRO-PLATING MACHINERY.
Crocker-Wheeler Co., Ampere, N. J.
Electric Machinery Co., Minneapolis, Minn.
Fairbanks, Morse & Co., Chicago.
Ft. Wayne Electric Wks., Ft. Wayne, Ind.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland, Ohio.
Pan Electric Mfg. Co., St. Louis, Mo.
Roth Bros. & Co., Chicago, Ill.
Sprague Electric Works, New York.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Allen Electric Co., Chicago, Ill.
Bell Electric Motor Co., New York.
W. S. Bishop, New Haven, Conn.
C. J. Bogue Electric Co., New York.
Boissier Electric Co., New York.
Burke Electric Co., Erie, Pa.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Dover Electric Mfg. Co., Canal Dover, Ohio.
Eager Electric Co., Watertown, N. Y.
Engineering Electric Mfg. Co., Stamford, Conn.
W. Green Elec. Co., New York.
Hanson & Van Winkle, Newark, N. J.
Holtzer-Cabot Electric Co., Brookline, Mass.
Ideal Electric & Mfg. Co., Mansfield, Ohio.
Jantz & Leist Electric Co., Cincinnati, Ohio.
Kendrick & Davis Co., Lebanon, N. H.
Kester Elec. Co., Terre Haute, Ind.
Lovett Mfg. Co., Matawan, N. J.
Chas. L'Hommedieu & Sons Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Phoenix Electric Co., Mansfield, Ohio.
Rochester Electric Motor Co., Rochester, N. Y.
U. S. Electrical Mfg. Co., Los Angeles, Cal.
Victor Electric Co., Chicago, Ill.

ELECTROSCOPES. (See Instruments. Testing.)

ELEVATORS, Electric.
Albro-Clem Elevator Co., Philadelphia, Pa.
Altizer & Prince Co., Chicago.
American Elevator Co., New York.
American Machine Co., Louisville, Ky.
Atlas Machine Co., Louisville, Ky.
Cohoes Iron Foundry & Machine Co., Cohoes, N. Y.
Eastern Machinery Co., New Haven, Conn.
Edmonds Elevator Co., Cleveland, Ohio.
Erickson-Wyman Co., Seattle, Wash.
Faunt LeRoy Elevator Co., Baltimore, Md.
F. Grote Mfg. Co., Evansville, Ind.
Gurney Elevator Co., Honesdale, Pa.
Haughton Elevator & Machine Co., Toledo, Ohio.
Houser Elevator Co., Syracuse, N. Y.
Lee & Hoff Mfg. Co., St. Paul.

Marshall Bros., Pittsburgh, Pa.
V. W. Mason & Co., Providence, R. I.
Wm. A. Miller Elevator Co., St. Louis, Mo.
Moore & Wyman Elevator & Machine Works, Boston, Mass.
Norwood Engrg. Co., Florence, Mass.
Ohio Elevator & Machine Co., Columbus, Ohio.
Otis Elevator Co., New York.
Reedy Elevator Co., New York
D. V. Reedy Elevator Co., Indianapolis, Ind.
H. J. Reedy Co., Cincinnati, O.
J. W. Reedy Elevator Mfg. Chicago, Ill. "Twentieth Century".
James H. Roberts Elevator Co., New York. (Dumb Waiters.)
Rochester Iron Works, Rochester, Minn.
A. B. See Elec. Elevator Co., New York.
Seelar Elevator Works, Pittsburgh, Pa.
Standard Plunger Elevator Co., New York.
Sybilla Elevator and Mfg. Co., Chattanooga, Tenn.
Van Emon Elevator Co., San Francisco, Cal.
Warner Elevator Mfg. Co., Cincinnati, Ohio.
Warsaw Elevator Co., Warsaw, N. Y.
Westbrook Elevator Co., Danville, Va.
Wheeler-McDowell Elevator Co., New York.

ENGINEERS & CONTRACTORS.
American Bridge Co., New York.
Beck Electrical Construction Kompany, Minneapolis, Minn.
Arnold Co., The, Chicago.
Badt-Westburg Electric Co., Chicago, Ill.
Byllesby & Co., H. M., Chicago.
Central Station Engineering Co., Chicago, Ill.
Cummings, W. F., Chicago, Ill.
Dixon-Smith Engineering Co., St. Louis, Mo.
Ford, Bacon & Davis, New York.
Foshay, Wilbur B., Portland, Ore.
Holladay, Negstad & Co., Inc., Chicago.
Humphrey, C. W., Chicago.
Jackson, D. C. & W. B., Chicago.
Kohler Bros., Chicago, Ill.
Lamar Lyndon, New York.
Lloyd-Thomas Co., Chicago, Ill.
McMeen & Miller, Chicago, Ill.
New England Engineering Co., New York, N. Y.
Nichols & Gilbert, Chicago, Ill.
Norton & Bird, Chicago, Ill.
Pillsbury, Chas. A., Minneapolis.
Sargent & Lundy, Chicago, Ill.
Stone & Webster Engrg. Corpn., Boston, Mass.
Turner Improvement Co., J. W., Des Moines, Iowa.
Western Electric Co., New York.
White & Co., J. G., New York, N. Y.
Woodmansee & Davidson, Inc., Chicago.

ENGINES, Gas and Gasoline.
Allis - Chalmers Manufacturing Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Chicago, Ill.
Westinghouse Machine Co., Pittsburgh, Pa.
Advance Mfg. Co., Hamilton, Ohio. "Ritchie". "Hamilton".
Alamo Mfg. Co., Hillsdale, Mich. (Electric Outfit.)
Angola Engine & Foundry Co., Angola, Ind.
Badger Gas & Gasoline Engine Co., Kansas City, Kan.
Bates & Edmonds Motor Co., Lansing, Mich.
Bates Machine Co., Joliet, Ill.
Bessemer Gas Engine Co., Grove City, Pa.
Bogart Gas Power Engrg. Co., Buffalo, N. Y.
Bruce-Macbeth Engine Co., Cleveland, Ohio.
Buckeye Engine Co., Salem, O.
W. P. Callahan Co., Dayton, Ohio.
Carlisle & Finch Co., Cincinnati, Ohio. (Generating Set.)
Cook Motor Co., Delaware, Ohio.
De La Vergne Machine Co., New York. "Koerting".
Detroit Engine Works, Detroit, Mich.
Dubois Iron Works, Du Bois, Pa.
Elbridge Engine Co., Rochester, N. Y.
Fairbanks Co., New York.
Farrar & Trefts, Buffalo, N. Y.
Foos Gas Engine Co., Springfield, Ohio.
Gade Bros. Mfg. Co., Iowa Falls, Ia.
Gray Motor Co., Detroit, Mich.
Heer Engine Co., Portsmouth, Ohio.
International Harvester Co., Chicago, Ill.
Mesta Machine Co., Pittsburg, Pa.
Minneapolis Steel & Machinery Co., Minneapolis. "Muenzel".
National Meter Co., New York, "Crown", "Nash".
New Era Gas Engine Co., Dayton, Ohio.
New York Engine Co., New York, N. Y.
Nordberg Mfg. Co., Milwaukee, Wis.
New York Safety Steam Power Co., New York. "Dock".
Olds Gas Power Co., Detroit, Mich.
Otto Gas Engine Works, Philadelphia, Pa.
Palmer-Moore Co., Syracuse, N. Y.
Rathbun-Jones Engrg. Co., Toledo, Ohio. "Rathbun".
Rochester Electric Motor Co., Rochester, N. Y. "Service".
Sheffield Gas Power Co., Kansas City, Mo.
Chas. A. Strelinger Co., Detroit, Mich. ("Brush" Lighting Set.)
J. Thompson & Sons Mfg. Co., Beloit, Wis. "Lewis".
Trenton Malleable Iron Co., Trenton, N. J.
Turner-Fricke Mfg. Co., Sharon, Pa.
Western Gas Engine Co., Los Angeles, Calif.
Wisconsin Engine Co., Corliss, Wis. "Complete Expansion", "Sargent".

ENGINES, OIL.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Busch-Sulzer Bros., Diesel Engine Co., St. Louis. "Diesel".
De La Vergne Machine Co., New York. "Hornsby-Akroyd".
Fairbanks, Morse & Co., Chicago, Ill.
August Mietz, New York. "Mietz & Weiss".
Samuel L. Moore & Sons, Corp., Elizabeth, N. J. "Crescent".
Remington Oil Engine Co., Stamford, Conn.
Chas. A. Strelinger Co., Detroit, Mich.

ENGINES, Steam.
Allis - Chalmers Manufacturing Co., Milwaukee, Wis.
Ridgway Dynamo & Engine Co., Ridgway, Pa.
Westinghouse Mach. Co., Pittsburgh, Pa.
American Blower Co., Detroit, Mich. "A. B. C."
American & British Mfg. Co., Providence, R. I.
American Engine Co., Round Brook, N. J. "American Ball".
Ames Iron Works, Oswego, N. Y.
Ball Engine Co., Erie, Pa.
Ball & Wood Co., Elizabethport, N. J.
Bates Machine Co., Joliet, Ill.
Brownell Co., Dayton, Ohio.
Buckeye Engine Co., Salem, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Chandler & Taylor Co., Indianapolis, Ind.
Comstock Mfg. Co., Comstock, Mich. "Climax".
C. & G. Cooper Co., Mt. Vernon, Ohio.
Erie City Iron Works, Erie, Pa. "Lane".
Erie Engine Works, Erie, Pa.
Erie Mfg. & Supply Co., Erie, Pa. "Erie".
Filer & Stowell Co., Milwaukee, Wis.
Fishkill Landing Machine Co., Fishkill Landing, N. Y.
Fitchburg Steam Engine Co., Fitchburg, Mass.
Franklin Iron Works, Pottsville, Pa.
Frick Co., Waynesboro, Pa. "Eclipse".
William A. Harris Steam Engine Co., Providence, R. I.
Harrisburg Foundry & Machine Works, Harrisburg, Pa.
Herrick Engine Co., New York. (Rotary.)
Hooven, Owens & Rentschler Co., Hamilton, Ohio. "Hamilton".
Houston, Stanwood & Gamble Co., Cincinnati, Ohio.
A. L. Ide & Sons, Springfield, Ill. "Ideal".
International Power Co., Providence, R. I. "Original George H. Corliss", "Green-Wheelock".
Ironton Engine Co., Ironton, Ohio. "Alfree".
Lane & Bodley Co., Cincinnati, Ohio. "Columbian"
Lyons-Atlas Co., Indianapolis, Ind.
Mcintosh, Seymour & Co., Auburn, N. Y.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Minneapolis Steel & Machinery Co., Minneapolis, Minn. "Twin City".
Murray Iron Works Co., Burlington, Iowa.
Nagle Corliss Engine Co., Erie, Pa.
New York Engine Co., New York. "Watertown".
New York Safety Steam Power Co., New York, N. Y.
Phoenix Iron Works Co., Meadville, Pa. "Dick & Church"
Providence Engrg. Works, Providence, R. I. "Rice & Sargent", "Greene".
Rochester Machine Tool Works, Rochester, N. Y. "Acme".
Rumley Company, Battle Creek, Mich.
Shepherd Engrg. Co., Williamsport, Pa.
Skinner Engine Co., Erie, Pa.
Southwark Foundry & Machine Co., Phila., Pa. "Porter-Allen".
B. F. Sturtevant Co., Hyde Park, Mass.
Sullivan Machinery Co., Chicago.
Wm. Tod Co., Youngstown, Ohio.
Vilter Mfg. Co., Milwaukee, Wis.
Vulcan Iron Works, Wilkes-Barre, Pa.
Watts-Campbell Co., Newark, N. J.
Robt. Wetherill & Co., Chester, Pa.
Wisconsin Engine Co., Corliss, Wis. "Higher Speed".
York Mfg. Co., York, Pa.

ESCALATORS. See Stairways.

EXCESS INDICATORS.
See Controllers, Flat Rate.

EXHAUSTERS.
See Blowers.

EXPANDERS, Boiler Flue.
J. H. Hallberg, New York.
Helios Mfg. Co., Philadelphia.

EXPANDERS, Boiler Tube.
J. Faesslef Mfg. Co., Moberly, Mo.

EXPANSION BOLTS.
See Bolts.

EXPERIMENTAL APPARATUS.
Esterline Co., The, Indianapolis, Ind.
Roller-Smith Co., New York.
Delta-Star Electric Co., Chicago.
Keystone Electrical Instrument Co., Philadelphia, Pa.
Thordarsen Electric Mfg. Co., Chicago, Ill.

EXTENSION BELLS.
See Generators and Magnetos.

EXTENSIONS, Socket.
Arrow Electric Co., Hartford, Conn.
Benjamin Elec. Mfg. Co., Chicago, Ill.
Faries Mfg. Co., Decatur, Ill.

EXTINGUISHERS, Fire.
H. W. Johns-Manville Co., New York.
Pyrene Mfg. Co., New York.
Western Electric Co., New York.
O. J. Childs Co., Utica, N. Y.
Staff Fire Extinguisher Co., Chicago.
Tea-Tray Co., Newark, N. J.

FAN DEFLECTORS.
See Deflectors.

FAN MOTOR RESISTANCE.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Western Electric Co., New York.

FANS, Battery.
See Motors, Battery.

FANS, Disc.
Central Electric Co., Chicago, Ill.
Crocker-Wheeler Co., Ampere, N. J.
Diehl Mfg. Co., Elizabethport, N. J.
Eck Dynamo & Motor Co., Belleville, N. J.
Emerson Electric Mfg. Co., St. Louis, Mo.
General Electric Co., Schenectady, N. Y.
Kimble Electric Co., Chicago, Ill.
Mechanical Appliance Co., Milwaukee, Wis. "Watson."
Peerless Electric Co., Warren, O.
Robbins & Myers Co., Springfield, Ohio.
Sprague Electric Works, New York. "Lundell."
Wagner Elec. Mfg. Co., St. Louis, Mo.
Western Electric Co., New York, N. Y. "Hawthorn."
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa
Acme Ventilating Co., Chicago Ill.
Aetna Heating Co., New Britain Conn. "Typhoon."
American Blower Co. (Sirocco Engineering Co.), Detroit Mich.
Barney Ventilating Fan Co., Boston, Mass.
Bayley Mfg. Co., Milwaukee, Wis
Buffalo Forge Co., Buffalo, N. Y
Champion Blower & Forge Co. Lancaster, Pa.
Geo. P. Clark Co., Windsor Locks, Conn.
Colonial Foundry & Machine Co. South Norwalk, Conn
Dayton Fan & Motor Co., Dayton, Ohio.
Dover Elec. Mfg. Co., Canal Dover, Ohio
Exeter Machine Works, Exeter N. H.
Fuller Co., Detroit, Mich
Garden City Fan Co., Chicago Ill.
Green Fuel Economizer Co., Matteawan, N. Y.
Howard & Morse, New York. "National." "Blackman."
Ilg Electric Ventilating Co., Chicago, Ill.
Indiana Fan Co., Indianapolis, Ind.
Massachusetts Fan Co., Watertown, Mass. "Davidson."
National Blower Works, Milwaukee, Wis.
New York Blower Co., Chicago.
E. M. Nichols, Philadelphia, Pa.
B. F. Perkins & Son, Holyoke, Mass.
Protective Ventilator Co., New York.
Rochester Electric Motor Co., Rochester, N. Y.
James M. Seymour, Jr., Newark, N. J.
J. F. Snediker, Philadelphia, Pa.
Sterling Blower Co., Hartford, Conn.
B. F. Sturtevant Co., Hyde Park, Mass.
Turbo Blower Co., New York.
L. J. Wing Mfg. Co., New York "Typhoon." (Turbine Blower System.)

FANS, Motor.
Desk, Ceiling, Column.
Central Electric Co., Chicago, Ill.
Century Electric Co., St. Louis.
Colonial Fan & Motor Co., Warren, Ohio.
Crocker - Wheeler Co., Ampere, N. J.
Diehl Mfg. Co., Elizabethport, N. J. "Universal."
Eck Dynamo & Motor Co., Belleville, N. J. "Hurricane."
Emerson Electric Mfg. Co., St. Louis, Mo.
Fairbanks, Morse & Co., Chicago.
Fort Wayne Electric Works, Ft. Wayne, Ind.
General Electric Co., Schenectady, N. Y.
Hamilton-Beach Mfg. Co., Racine, Wis. "Cyclone".
Hunter Fan & Motor Co., New York. ("Portable", "H. E.", "Tuerk", Ceiling.)
Manhattan Electrical Supply Co., New York. "Mesco."
Marelli & Co., Ltd., E., New York.
Peerless Electric Co., Warren, O.
Robbins & Myers Co., Springfield, Ohio. "Standard."
Sprague Electric Works, New York. "Lundell."
Western Electric Co., New York. "Victor." "Hawthorn."
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Adams - Bagnall Electric Co., Cleveland, Ohio. "Jandus." "Gyrofan."
D. L. Bates & Bro. Co., Dayton, Ohio.
Carleton Co., Boston.
Dayton Fan & Motor Co., Dayton, O.
Fidelity Electric Co., Lancaster, Pa. ("Eclipse" Socket Fans.)
Fulton-Bell Co., New York, N. Y. "Cyclone".
Menominee Elec. Mfg. Co., Menominee, Mich. (Portable only.)
Shedd Electric Co., Roselle, N. J

FAULT FINDERS.
See also Instruments Testing
Electric Controller & Mfg. Co., Cleveland, O.
W. N. Matthews & Bro., St. Louis, Mo.

FEEDER ARMS.
See Brackets.

FELT.
American Felt Co., Boston, Mass
Bacon Felt Co., Winchester, Mass.
N. E. Booth, Brooklyn, N. Y.
Boston Felt Mfg. Co., Boston, Mass.
The Felters Co., New York.
Kenworthy Bros. & Co., Boston, Mass.
F. E. Paige & Co., Boston, Mass.
Tingue, Brown & Co., New York.
Western Felt Works, Chicago, Ill
Joseph Wild & Co., New York.

FIBRE, Hard.
Diamond State Fibre Co., Bridgeport, Pa.
American Vulcanized Fibre Co., Wilmington, Del.
Concrete Fibre Co., Norristown, Pa.
Continental Fibre Co., Newark, Del.
Delaware Hard Fibre Co., Wilmington, Del.
Eastern Hard Fibre Co., Merrimac, Mass.
Empire Mfg. Co., Wilmington, Del.
Eureka Supply Co., Sewell, N. J. (Fibre Insulators.)
Keystone Fibre Co., Chester, Pa
Formica Insulation Co., Cincinnati, Ohio.
Leatheroid Mfg. Co., Kennebunk Me. "Diridge."
National Fibre Board Co., Kennebunk, Me.

National Fibre & Insulation Co., Yorklyn, Del.
Royal Fibre Co., North Cambridge, Mass.
J. Spaulding & Sons Co., North Tonawanda, N. Y. "Cochece."
Standard Fibre Co., Sommerville, Mass.
Wilmington Fibre Specialty Co., Wilmington, Del.

FIELD COIL VARNISH.
See Varnish.

FILAMENTS, Inc. Lamp.
Fahn & McJunkin, New York. "Pianchon."
Filament Supply Co., Boston, Mass.
Francis E. Jackson, Orange, N. J.

FILTERS, Oil.
Fairbanks, Morse & Co., Chicago.
Elliott Co., Pittsburgh, Pa.
Franklin Oil Filter Co., St. Louis, Mo.

FIRE ALARMS, POLICE SIGNALS, CALL BOXES.
Manhattan Electrical Supply Co., New York.
The Palmer Electric & Mfg. Co., Boston, Mass.
Western Electric Co., New York, N. Y.
American Electric Fire Alarm & Mfg. Co., Pittsburgh, Pa.
Baltimore Machine Products Co., Baltimore Md. "Viaduct."
Bullock Safety Appliance Co., Poughkeepsie, N. Y. (Closed Circuit Fire Alarm System.)
J. H. Bunnell & Co., New York.
Dean Electric Co., Elyria, Ohio.
Denio General Electric Co., Rochester, N. Y.
De Veau Telephone Mfg. Co., Brooklyn, N. Y. "AUth."
Edwards & Co., New York.
Electrical Automatic Appliance Co., Denver, Colo.
Foote, Pierson & Co., New York.
Gamewell Fire Alarm Teleg. Co., New York.
Garl Electric Co., Akron, Ohio.
Holtzer-Cabot Elec. Co., Brookline, Mass. (Break Glass.)
International Electric Protection Co., New York.
McFell Electric Co., Chicago, Ill.
National Electric Works, Whittier, Cal. (School System Fire Alarm.)
Partrick, Carter & Wilkins Co., Philadelphia, Pa.
Frederick Pearce Co., New York.
Signalphone Alarm Co., Milwaukee, Wis.
Special Fire Alarm Electric Signal Co., New York.
Star Electric Co., Binghamton, N. Y.
Geo. M. Stevens Co., Boston.
United Electric Apparatus Co., Boston, Mass.
Utica Fire Alarm Tel. Co., Utica, N. Y.

FIRE EXTINGUISHERS.
See Extinguishers.

FIREPLACES, Electric.
(See also Radiators.)
General Electric Co., Schenectady.
Universal Elec. Stage Lighting Co., New York. "Kliegl."
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FIREPROOF WOOD.
H. W. Johns-Manville Mfg. Co., New York, N. Y.

FISH WIRE.
See Wire, Fish.

FISHING MACHINES, Conduit Fishing.
Pneumatic Conduit Threader Co., Inc., Richmond, Va.
Conduit Threading Device Co., Pasadena, Calif.

FITTINGS, Conduit Terminals, Bushings, Entrance Caps.
Appleton Electric Co., Chicago, Ill. "No Thread", "Unilets".
Arrow Electric Co., Hartford, Conn. (Pipe Ends.)
Frorup & Co., L. E., New York, N. Y. "Caplets".
New Process Specialty Co., Inc., Milwaukee, Wis.
Newton Mfg. Co., Lynbrook, N. Y.
H. T. Paiste Co., Phila., Pa. "Taplets".
Sprague Electric Works, New York. "Multilets".
Western Electric Co., New York.
Chase-Shawmut Co., Newburyport, Mass.
Crouse-Hinds Co., Syracuse, N. Y. "Condulets".
Electric Specialty Mfg. Co., Providence, R. I. ("Boss" Entrance Bushing.)
Fairmount Electric & Mfg. Co., Phila., Pa. (Bendhicks.)
Gillette-Vibber Co., New London, Conn.
James C. Phelps, Springfield, Mass. ("J. C. P." Porcelair. Cupleta.)
Troy Elect. Co., Troy, N. Y. "Teco".
V V Fittings Co., Philadelphia.

FITTINGS, Fixture (Brass).
Arrow Electric Co., Hartford, Conn.
Faries Mfg. Co., Decatur, Ill.
American Brass & Copper Co., New York.
Art Brass & Fixture Mfg. Co., McKees Rocks, Pa.
Brandt-Dent Co., Watertown, Wis.
Fairmont Elec. & Mfg. Co., Phila., Pa. "Arclets" ("Emery" Tripods.)
Goshen Stamping & Brass Co., Goshen, Ind.
Hudson Brass Works, New York.
Mayer & Reichert, Brooklyn, N. Y. (Fixture Cocks.)
New York Brass Turning Co., New York.
W. W. Partridge, Chicago, Ill.
United Metal Mfg. Co., New York.
J. H. White Mfg. Co., Brooklyn.
R. Williamson & Co., Chicago, Ill.

FITTINGS, Fixture (Iron), Crow Feet, Deupods.
Faries Mfg. Co., Decatur, Ill.
American Brass & Copper Co., New York, N. Y.
Stanley G. Flagg & Co., Philadelphia, Pa.
Macallen Co., Boston, Mass.

FITTINGS, Marine.
See Fixtures, Marine.

FIXTURE ASSEMBLERS' TOOLS.
Goshen Stamping & Brass Co., Goshen, Ind.

FIXTURE CLUSTERS.
See Clusters.

FIXTURE FITTINGS.
See Fittings.

FIXTURE HANGERS.
See Hangers.

FIXTURE STUDS.
See Studs.

FIXTURES, Advertising.
(See also Sidewalk Sign Projectors.)
General Electric Co., Schenectady, N. Y.
Atwater Mfg. Co., North Chicago, Ill. ("Cyclo" Revolving Barber Pole.)
General Appliance Mfg. Co., Long Beach, Cal. "Auto Illuminating Advertiser".
S. H. Hoggson & Co., Arlington, N. J. ("Hemafam" Advertising Mechanism.)
Meyercord Co., Chicago, Ill. (Advertising Specialties.)
Multipiex Display Fixture Co., St. Louis, Mo. (Advertising Specialties.)
National Automatic Advertising Co., Chicago. (Stereopticon Advertising Machine.)
Newman Mfg. Co., Cincinnati, O.
Oral & Motion Mfg. Co., Chicago, Ill. (Talking and Moving Advertising Device.)
C. L. Thorne Mfg. Co., Chicago, Ill. (Window Tapper.)
Turner-Ligon Advertising Clock Co., Union City, Tenn.

FIXTURE STRAIGHTENERS.
Federal Sign System (Electric), Chicago, Ill.
Fairmount Electric & Mfg. Co., Philadelphia, Pa.

FIXTURES, Electric & Gas, Tungstoliers, Mazdaliers, Gas Fixtures and Chandeliers.
Brassart Fixture Co., New York, N. Y.
Frank Adam Electric Co., St. Louis, Mo. ("FA.")
Beardslee Chandelier Mfg. Co., Chicago, Ill.
Benjamin Elec. Mfg. Co., Chicago, Ill.
Central Electric Co., Chicago, Ill.
Delta-Star Electric Co., Chicago.
Edwards Lighting Fixture Co., Chicago.
Electric Operations Co., Brooklyn, N. Y.
Faries Mfg. Co., Decatur, Ill.
Federal Sign System (Electric), Chicago, Ill.
Line Material Co., South Milwaukee, Wis.
Metropolitan Engineering Co., Brooklyn, N. Y.
Shapiro & Aronson, New York City.
Tungstolier Works of General Electric Co., Cleveland, O. (Mazdaliers, Luminier Units.)
Western Electric Co., New York. "Hawthorn" Mazdaliers.
Wheeler Reflector Co., Boston, Mass.
T. C. White Co., St. Louis, Mo.
Adams-Bagnall Elect. Co., Cleveland, Ohio. "Abolite".
Black & Boyd Mfg. Co., New York.
Boyse & Carmichael, Chicago, Ill.
Bradley & Hubbard Mfg. Co., Meriden, Conn.
Brandt-Dent Co., Watertown, Wis. ("Bee-Dee.")
Bullington, H. E., Richmond, Va.
Caldwell & Co., E. P., New York City. ("Caldwell.")
Cassidy & Son, New York City. ("Cassidy.")
Catlett Elec. Co., W. B., Richmond, Va.
Century Gas & Elec. Fixture Co., New York City.
Chicago Gas & Elec. Fixture Co., Chicago, Ill.
Columbia Gas Fixture Co., New York City.
Crescent Art Metal Co., Bridgeton, N. J.
The Dale Co., New York City.
Elgin Motor Co., Elgin, Ill. "Deflectolier."
Empire Gas Fixture Co., New York City.
Fairmount Elec. & Mfg. Co., Philadelphia, Pa.
Frink, I. P., New York City.
Gas Fixture & Brass Co., Cleveland, Ohio.
Gibson Gas Fixture Works, Philadelphia, Pa.
Geise Mfg. Co., Philadelphia, Pa.
Haskins, Arthur R., Los Angeles, Cal.
Hill Co., T. D., Philadelphia, Pa.
Horn & Brennen Mfg. Co., Philadelphia, Pa.
Illuminating Engineering Co., Detroit, Mich.
Ivanhoe Metal Works, Cleveland, Ohio.
Jenks, W. H., Richmond, Va.
Keystone Type Foundry, Philadelphia, Pa.
McCoy & Sons, J. B., New York City. "McCoy."
Mercantile Advertising Fixtures, New York City.
Meyercord Co., Inc., Chicago, Ill. "Capitol."
Miller & Co., Edw., Meriden, Conn. "Miller."
Mitchell Vance Co., New York City.
Morreau Co., The, Cleveland, Ohio.
Morse, Frank W., Boston, Mass.
Nelson, Thyge, Chicago, Ill.
Plaut Co., L., New York City.
Post-Glover Elec. Co., Cincinnati, Ohio.
Royal Art Glass Co., New York City.
Scott-Ullman Co., Cleveland, Ohio.
Sechrist Co. Albert, Denver, Colo. ("Sechrist Patent Electroliers")
Simes, R. J., New York City.
Sterling Bronze Co., New York City.
Vossberg, Gustav, Toledo, Ohio.
Wahle, Phillips Co., New York City.
Warren & Co., Walter G., Chicago, Ill.
St. Louis Brass Mfg. Co., St. Louis, Mo.
F. W. Wakefield Brass Co., Vermilion, Ohio.
Williamson & Co., R., Chicago, Ill.

FIXTURES, Indirect Lighting.
Central Electric Co., Chicago, Ill. "Alexalite".
Faries Mfg. Co., Decatur, Ill.
Federal Sign System (Electric), Chicago, Ill.
General Electric Co., Schenectady, N. Y.
H. W. Johns-Manville Co., New York.
Luminous Unit Co., St. Louis, Mo.
National X-Ray Reflector Co., Chicago.
Macbeth-Evans Glass Co., Pittsburgh, Pa.

FIXTURES, Show Case.
Benjamin Electric Mfg. Co., Chicago, Ill.
Central Electric Co., Chicago, Ill.
H. W. Johns-Manville Co., New York. "Linolite".
American Reflector & Lighting Co., Chicago, Ill.
Diamond Show Case Co., Cleveland, Ohio.
L. Erickson Electric Co., Boston.
Frink, I. P., New York City.
Garden City Plating & Mfg. Co., Chicago, Ill.
Grand Rapids Fixture Co., Grand Rapids, Mich.
Grand Rapids Show Case Co., Grand Rapids, Mich.
Charles W. Leveredge, New York.
National X-Ray Reflector Co., Chicago, Ill.
Overbagh & Ayres Mfg. Co., Chicago, Ill. "Oamco".
W. W. Partridge, Chicago, Ill.
Reflector & Hdw. Specialty Mfg. Co., Chicago, Ill. "Taussig".
St. Louis Brass Mfg. Co., St. Louis, Mo.
Weeks, Nelson, New York.
Wilmarth Show Case Co., Grand Rapids, Mich.
Youngstown Glass & Paint Co., Youngstown, Ohio.

FIXTURES, STREET LIGHTING.
For bracket and suspension fixtures, see Street Lighting Fixtures.
For lamp-posts, see Posts.

FIXTURES, Wood.
Carroll Co., L. W., Riverside, Ill.
Falkenbach, E., New York (Wood Fibre.)
Lewis Co., A. L., Greensburg, Ind.

FLASHERS, Sign.
F. Bissell Co., Toledo, Ohio.
Campbell Electric Co., Lynn, Mass.
A. & W. Elec. Sign Co., Cleveland, Ohio.
Betts & Betts Corp., New York "Betts" "Vacu".
Eagle Electric Co., Topeka, Kan.
Electric Carriage Call & Specialty Co., New York.
Flexlume Sign Co., Inc., Buffalo, N. Y.
Gillette Electric Co., Chicago, Ill.
Glaze-Morris Mfg. Co., Columbus, Ohio. "Jem".
S. H. Hoggson & Co., Arlington, N. J. "Hemafam".
J. O. Houser Mfg. Co., Buffalo, N. Y. "Economy".
In-er Globe Lamp Co., Boston, Mass.
Kelley & Kelley, Brooklyn, N. Y. "Tic-Tac", "Thermo-Blink".
Phelps Mfg. Co., Detroit, Mich. "Surewink," "Motorless," "Skedoodle."
Reynolds-Dull Flasher Co., Chicago, Ill.
Reynolds Electric Co., Chicago. "New Reco."
C. O. Schneider & Co., Chicago, Ill. "Firefly".

FLASHLIGHTS.
Central Telephone & Electric Co., St. Louis, Mo.
Federal Sign System (Electric), Chicago.
Kruschke, R. C., Duluth, Minn.
Merchant Engineers Corporation, New York. "Jove."
Metal Specialties Mfg. Co., Chicago. "Presto", "Flashlight".
Niagara Searchlight Co., New York.
Stanley & Patterson, New York. "Matchless".
Usona Mfg. Co., New York City.
Western Electric Co., New York.
American Ever Ready Co., New York. "Ever Ready".
Argus Battery Co., Willimantic, Conn.
Edward E. Cary Co., New York.
Electro Importing Co., New York, N. Y. (Importers.)
Elux Miniature Lamp Works, New York.
Franco-American Electric Novelty Co., New York.
Industrial Novelty Co., Chicago, Ill. (Importers.)
Interstate Electric Novelty Co., New York.
E. Marcuson, New York. "Knockabout".
National Carbon Co., Cleveland.
Portable Elec. Safety Light Co., Newark, N. J. ("Hubbell" Storage Battery.)
Providence Electric Mfg. Co., Providence, R. I. "Nitelite." "Little Rhody".
P. W. Electric Co., Toledo, O.
Standard Electric Novelty Co., Chicago, Ill.
Standard Sheet Metal Co., Passaic, N. J. "Rayflex".
E. J. Tardie, New York, N. Y.
Universal Novelty Co., New York "Milwaukee." "Eclipse."
Vesta Accumulator Co., Chicago, Ill. (Storage Battery.)
Voltamp Electric Mfg. Co., Baltimore, Md.

FLAT IRONS, Electric.
Central Electric Co., Chicago, Ill.
Current Electric Co., Chicago, Ill.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Lindstrom-Smith Co., Chicago.
Manhattan Electrical Supply Co., New York "Mesco."
Rutenber Electric Co., Logansport, Ind.
Simplex Electric Heating Co., Cambridge, Mass. "Simplex."
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. "Westinghouse."
American Electrical Heater Co., Detroit, Mich. "Triangle."
Bliss & Drake, Newark, N. J.
Chicago Flexible Shaft Co., Chicago.
Collier Electric Co., Peterborough, Ont., Can.
Dover Mfg. Co., Canal Dover, O ("Abesto".)
Economy Electric Co., Brooklyn.
Electric Mfg. Co., San Francisco, Calif.
Guaranty Electric Heater Co., Cleveland, Ohio.
Hellon Electric Co., Newark, N. J.
Hindsill Electric Co., Troy, N. Y ("Brownie" Sad Iron.)
Hot Point Elec. Heating Co., Ontario, Cal.
Loetscher-Ryan Mfg. Co., Dubuque, Ia.

Pelouse Mfg. Co., Chicago, Ill ("Universal" Sad Irons.)
Pfanstiehl Electric Laboratory, North Chicago, Ill.
Phelps Mfg. Co., Detroit, Mich. "So-Easy" and "Venus."
Rochester Stamping Co., Rochester, N. Y.
Van Mfg. Co., Braddock, Pa.
Victor Iron Co., Logansport, Ind. (Sad Irons.)
Vulcan Electric Heating Co., Buffalo, N. Y.

FLAT RATE CONTROLLERS.
See Controllers.

FLEXIBLE TUBING.
See Tubing.

FLOOR BOXES.
See Boxes, Floor.

FLOOR CLEANERS AND POLISHERS, Motor Driven Scrubbers and Surfacers.
American Floor Surfacing Machine Co., Toledo, Ohio.
Electric Rotary Machine Co., Chicago, Ill.
Floor Sanding & Polishing Machine Co., Philadelphia, Pa.
Henderson Electric Co., Charlottesville, Va.
Kelley Electric Machine Co., Buffalo, N. Y.
Leader Mfg. Co., Hartford, Conn. "Leader."
Ransome Concrete Machinery Co., Dunellen, N. J.
M. L. Schlueter, Chicago, Ill.

FLUXES, Soldering.
L. B. Allen Co., Chicago.
Blake Signal & Mfg. Co., Boston.
Burnley Battery & Mfg. Co., North East, Pa.
H. W. Johns-Manville Co., New York. ("Solderall" Paste.)
Manhattan Electrical Supply Co., New York. "Excelsior."
McGill Mfg. Co., Valparaiso, Ind. ("Star" Stick Paste & Fluid.)
Prest-O-Lite Co., Inc., Indianapolis, Ind.
Western Electric Co., New York. ("Hawthorn" Stick.)
Alex R. Benson Co., Hudson, N. Y. ("Yager's".)
Brunner Chemical Works, Cincinnati, Ohio. "Queene".
Bull Dog Specialty Co., South Bend, Ind. (Stick & Paste.)
Geo. Callahan & Co., New York. (Fluid.)
Central Stamping Co., New York. ("Soldering" Paste and Salts.)
Chicago Solder Co., Chicago, Ill. ("Kester" Paste and Salt.)
Como Electrical Co., Spring Lake, N. J. "Hiko".
Di-Electric Mfg. Co., St. Louis.
Dow Chemical Co., Midland, Mich.
M. W. Dunton Co., Providence, R. I. "Nokorode".
Electric Traction Supply Co., St. Louis, Mo. ("T. X. L." Salts.)
Elliott Chemical Works, Newton, Mass. (Fluid.)
Grasselli Chemical Co., Cleveland, Ohio. "Eureka," "Standard," "Snowflake."
Wm. J. Hartwig Co., Detroit, Mich. "New Idea".
Hess & Son, Philadelphia, Pa. ("Tinol" Paste.)
Highland Electro-Chemical Mfg. Co., Connellsville, Pa.
Chas. W. Leveridge, New York. "Yankee".
Read Mfg. Co., Hoboken, N. J. ("Incomparable" Fluid.)
Ruby Chemical Co., Johnstown, Ohio. ("Imperial" Paste and Salts.)
Emil Schneider, Inc., Newark, N. J.
Standard Chemical Co., Cincinnati, Ohio. ("Imperial" Paste and Salts.)
J. F. Walsh Co., Pittsfield, Mass. ("Norcross" Stick, Paste and Fluid.)

FORGINGS.
American Bridge Co., New York.

FORMERS, Armature.
See Coil Forming Devices.

FORMERS, Tie Wire.
Chance Mfg. Co., Centralia, Mo.
Only Mfg. Co., Moravia, Iowa.

FOUNTAINS, Electric.
Battaglia Elec. Fountain Co., New York.
F. W. Darlington, Philadelphia, Pa.
M. B. Jones, Boston, Mass.

FREQUENCY INDICATORS.
Badt-Westburg Electric Co., Inc., Chicago.
General Electric Co., Schenectady, N. Y.
Roller-Smith Co., New York.
James G. Biddie, Philadelphia. "Frahm".

FRICTION TAPES & CLOTHS.
See Tape.

FRINGES.
See Crystals.

FROSTING.
See Coloring.

FUEL ECONOMIZERS.
See Economizers.

FULLER BOARD.
See Paper.

FURNACES, Electric.
See also Heating Devices.
Current Electric Co., Chicago, Ill.
American Electric Furnace Co., New York.
W. Green Electric Co., New York.
Hoskins Mfg. Co., Detroit, Mich.
Keystone Electrical Instrument Co., Philadelphia, Pa.
Electric Heating Apparatus Co., 133 East 16th St., New York.
Pelton & Crane Co., Detroit, Mich.

FUSE BLOCKS.
See Cut-Outs.

FUSE PLUGS.
Anderson Mfg. Co., Albert & J. M., Boston, Mass.
Arrow Electric Co., Hartford, Conn. "Arrotype."
Chicago Fuse Mfg. Co., Chicago, Ill.
Condit Elec'l Mfg. Co., Boston, Mass.
Daum Co., A. F., Pittsburgh, Pa.
D & W Fuse Co., Providence, R. I.
General Electric Co., Schenectady, N. Y.
Johns-Manville Co., H. W., New York. "Noark".
Paiste Co., H. T., Philadelphia, Pa. "Fusettes."
Premier Electric Mfg. Co., Bridgeport, Conn. ("Premier".)
Stanley & Patterson, New York, N. Y.
Union Electric Co., Trenton, N. J.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Western Electric Co., New York, N. Y.
Bryant Electric Co., Bridgeport, Conn. "Pyrotite."
Bussmann Mfg. Co., St. Louis, Mo.
Electric Fuseguard Co., Newark, N. J.
Russell & Stoll Co., New York.
Weber Electric Co., Boston, Mass.
Wirt Mfg. Co., Burrage, Mass. "Wirt."

FUSE SWITCH BOXES.
See Switches, Disconnecting.

FUSED SWITCHES. See Switches, Combination Cutout.

FUSE TESTERS.
See Testers.

FUSE WIRE.
Appleton Electric Co., Chicago.
Chicago Fuse Mfg. Co., Chicago.
Condit Elec'l Mfg. Co., Boston, Mass. "Shawmut."
General Electric Co., Schenectady, N. Y.
Western Electric Co., New York.
Harvard Electric Co., Chicago, Ill.

FUSES, ENCLOSED, Cartridge Type, (Approved).
Central Electric Co., Chicago, Ill.
Chicago Fuse Mfg. Co., Chicago.
Condit Elec'l Mfg. Co., Boston, Mass. "Shawmut."
D & W Fuse Co., Providence, R. I.
Detroit Fuse & Mfg. Co., Detroit, Mich. "Arkless."
General Electric Co., Schenectady, N. Y.
H. W. Johns-Manville Co., New York, N. Y.
Metropolitan Engineering Co., New York City.
Westinghouse Electric Mfg. Co., E. Pittsburgh, Pa.
Bryant Electric Co., Bridgeport, Conn. "Bryant."
Bussmann Mfg. Co., St. Louis, Mo.
Chase-Shawmut Co., Newburyport, Mass. "Shawmut."
United Elec. Supply Co., Brooklyn, N. Y. "United."

FUSES, ENCLOSED, Cartridge Type, (Refilled).
Daum, A. F., Co., Pittsburgh, Pa.
Economy Fuse & Mfg. Co., Chicago, Ill.
Metropolitan Engineering Co., New York City.
Monarch Refillable Fuse Co., Buffalo, N. Y.
Multi Refillable Fuse Co., Chicago, Ill.
Ackley Brake & Supply Co., New York.
James S. Johnston Mfg. Co., Utica, N. Y., ("Visible" Refilled.)
Long Beach Electric Co., Long Beach, Cal. "Tidmarsh Recharging."
E. W. Snow & Co., Rochester, N. Y. (Refilled.)

FUSES, Enclosed, Cartridge Type. (Renewable.)
Daum Co., A. F., Pittsburgh, Pa.
Economy Fuse & Mfg. Co., Chicago, Ill.
Trio Mfg. Co., Rock Island, Ill.
Multi Refillable Fuse Co., Chicago, Ill.

FUSES, High Tension.
Delta-Star Electric Co., Chicago.
Electric Fuseguard Co., Newark, N. J
Metropolitan Engineering Co., New York City.
Schweitzer & Conrad, Chicago, Ill., S. & C. High Potential.
Chemelectric Co., Chicago.
Railway and Industrial Engineering Co., Pittsburgh, Pa.

FUSES, Open Link.
Appleton Electric Co., Chicago.
Chicago Fuse Mfg. Co., Chicago.
General Electric Co., Schenectady, N. Y.
Metropolitan Engineering Co., New York City.
Westinghouse Electric Mfg. Co., E. Pittsburgh, Pa. (Aluminum.)
Chase-Shawmut Co., Newburyport, Mass. "Shawmut."
Walker Electric Co., Philadelphia, Pa.

FUSES, Telephone and Telegraph.
Appleton Electric Co., Chicago, Ill. "Veribest."
Central Telephone & Electric Co., St. Louis, Mo. "Gilgen."
Chicago Fuse Mfg. Co., Chicago.
D & W Fuse Co., Providence, R. I.
H. W. Johns-Manville Co., New York, N. Y.
Baltimore Machine Products Co., Baltimore, Md. (Telegraph Protectors.)
Cook, Frank B., Chicago, Ill.
Electric Fuseguard Co., Newark, N. J.
Foote-Pierson Co., New York, N. Y. (Telegraph Protectors.)
Hall, Frank B., Newton Falls, O.
Wm. J. Hartwig Co., Detroit, Mich.
Harvard Electric Co., Chicago, Ill. "Greer."
Lafayette Electric & Mfg. Co., Lafayette, Ind. (Heat Coils.)
Nagel-Chase Mfg. Co., Chicago, Ill. "N. C."
Reliable Electric Co., Chicago, Ill.

GAINS, Steel.
Hallett Iron Works, Harvey, Ill.

GALVANOMETERS.
See Instruments.

GARAGE PUMPS.
See Pumps, Garage.

GAS ENGINES.
See Engines, Gas.

GAS FIXTURE ATTACHMENTS.
See Attachments, Gas.

GAS LIGHTING BURNERS.
See Burners, Gas Lighting.

GAS PRODUCERS.
See Producers, Gas.

GASKETS, Metallic.
See Packing.

GATES, Head.
American Bridge Co., New York.

GAUGE COCKS, Water.
Ohio Brass Co., Mansfield, Ohio.
Williams Gauge Co., Pittsburgh, Pa.

GAUGES, Battery.
(See also Ammeters.)
Hoyt Electrical Instrument Wks., Penacook, N. H.
Manhattan Electrical Supply Co., New York, N. Y. "Universal," "Ditmar," "Elite."
American Ever Ready Co., New York, N. Y.
Atwater Kent Mfg. Works, Philadelphia, Pa. "Dri-Sell."
Baird Elec. Co., Chicago, Ill.
Connecticut Tele. & Elec. Co., Meriden, Conn.
Dow Mfg. Co., Braintree, Mass.
Eldredge Elec. Mfg. Co., Springfield, Mass. "Advance," "Express." "Eclipse."
Never-Miss Mfg. Co., Lansing, Mich.
Robert Instrument Co., Detroit, Mich.
Standard Electric Time Co., Waterbury, Conn. "Warner's."

GAUGES, Wire.
Manhattan Electrical Supply Co., New York. ("U. S." "Luts," Self-Registering.)
Brown & Sharpe Mfg. Co., Providence, R. I.
Novelty Electric Co., Philadelphia, Pa. "Neco."
M. S. Shapleigh, Roslyn, Pa. (Self-Registering.)
L. S. Starrett Co., Athol, Mass.
Vulcan Hdw. Co., Carlstadt, N. J.

GEARS, Rawhide and Composition.
Diamond State Fibre Co., Bridgeport, Pa.
General Electric Co., Schenectady, N. Y.
New Process Gear Corporation, Syracuse, N. Y.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Grant Gear Works, Boston, Mass.
Horsburgh & Scott Co., Cleveland, Ohio. "Peerless."
R. D. Nuttall Co., Pittsburgh, Pa.
Van Dorn & Dutton Co., Cleveland, Ohio.
Western Rawhide & Belting Co., Milwaukee, Wis. "Superior."

GEARING, Silent Flexible.
Morse Chain Co., Ithaca, N. Y.

GENERATORS.
(See also Motors and Dynamos.)
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Crocker-Wheeler Co., Ampere, N. J.
Diehl Mfg. Co., Elizabeth, N. Y.
Electric Machinery Co., Minneapolis, Minn.
Fairbanks, Morse & Co., Chicago.
Fort Wayne Electric Works, Fort Wayne, Ind.
General Electric Co., Schenectady.
Mechanical Appliance Co., Milwaukee, Wis.
Ridgway Dynamo & Engine Co., Ridgway, Pa.
Triumph Electric Co., Cincinnati.
Wagner Elec. Mfg. Co., St. Louis, Mo.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GENERATING SETS.
See Plants, Lighting.

GLASS COVERS.
Haskins Glass Co., Wheeling, W.Va.

GLASSWARE, Illuminating.
Holophane Works of General Electric Co., Cleveland, O.
Pittsburgh Reflector & Illuminating Co., Pittsburgh, Pa.
Phoenix Glass Co., New York, N. Y. "Pheno."
Western Electric Co., New York, N. Y.
Cleveland Window Glass & Door Co., Cleveland, Ohio. "Cleveglass."
Consolidated Lamp & Glass Co., Coraopolis, Pa.
Franz Euler & Co., New York, N. Y. (Importers.)
Fensterer & Ruhe, New York, N. Y.
Friedelaender, Oscar O., New York, N. Y. (Importer.)
Gill & Co., Inc., Philadelphia, Pa.
Gill Bros. Co., Steubenville, O.
Gillinder & Sons, Philadelphia, Pa. "Maglan."
Gleason-Tiebout Glass Co., Jefferson Glass Co., Follansbee, W. Va.
Krakno Glass Co., Pittsburgh, Pa. "Ray Do."
Lighting Studios Co., New York N. Y.
National X-Ray Reflector Co., Chicago, Ill. "Scoop," "Helmet," "Poke-Bonnett," "X-Ray," "I-Comfort."
Opalux Co., New York, N. Y. "Camia," "Carra," "Glerleco" "Opalux."
Pairpoint Corporation, New Bedford, Mass.
Pittsburg Lamp, Brass & Glass Co., Pittsburgh, Pa.
St. Louis Brass Mfg. Co., St. Louis, Mo.
Wellington Glass Co., Cumberland, Md.

GLOBE NETS AND GUARDS.
See Nets.

GLOBES, Arc Light.
(Outer and Inner.)
General Electric Co., Schenectady, N. Y.
Holophane Works of General Electric Co., Cleveland, O.
Phoenix Glass Co., New York. (Inner and Outer.)
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Edward E. Cary Co., New York. (Importers "Cohesive".)
Fensterer & Ruhe, New York (Import, Inner.)
Haskins Glass Co., Wheeling, W. Va.
Gill & Co., Inc. (Washington Flint Glass Works), Philadelphia, Pa.
Gill Bros. Co., Steubenville, O.
Gillinder & Sons (Franklin Flint Glass Works), Philadelphia, Pa.
Gleason-Tiebout Glass Co., Brooklyn, N. Y.
Libbey Glass Co., Toledo, Ohio. (Inner.)
Lippincott Glass Co., Alexandria, Ind.
Macbeth-Evans Glass Co., Pittsburgh, Pa.
Mound Valley Glassware Mfg. Co., Mound Valley, Kas.
Pairpont Corporation, New Bedford, Mass.
Wellington Glass Co., Cumberland, Md.

GLOBES, Glass.
See Glassware; also Marine Fixtures.

GLOBES, Waterproof.
("Vaporproof" Globes.)
Federal Sign System (Electric), Chicago, Ill.
E. H. Freeman Electric Co., Trenton, N. J.
Henry Newgard & Co., Chicago.

GLOVES, Linemen's.
Morrison-Ricker Mfg. Co., Grinnell, Ia.

GLOVES, Rubber.
Western Electric Co., New York.
Canton Rubber Co., Canton, Ohio.
Goodyear's India Rubber Glove Mfg. Co., New York, N. Y.

GLUE POTS, Electric.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Diamond Electric Co., Binghamton, N. Y.
General Electric Co., Schenectady, N. Y.
Simplex Electric Heating Co., Cambridge, Mass.
American Electrical Heater Co., Detroit, Mich.
International Electric Co., Indianapolis, Ind.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GONGS, Electro Mechanical.
W. R. Ostrander & Co., New York, N. Y.
Simplex Electric Heating Co., Cambridge, Mass.
Western Electric Co., New York.
J. H. Bunnell & Co., New York, N. Y.
Edwards & Co., New York.
Electric Goods Mfg. Co., Canton, Mass. "Sun."
Gamewell Fire Alarm Tel. Co., New York, N. Y.
Holtzer-Cabot Electric Co., Brookline, Mass.
Partrick, Carter & Wilkins Co., Philadelphia, Pa.
Frederick Pearce Co., New York, N. Y.
Railroad Supply Co., Chicago, Ill.
Star Electric Co., Binghamton, N. Y.

GONGS (Unmounted Bells).
Bridgeport Brass Co., Bridgeport, Conn.
The American Tube & Stamping Co., Bridgeport, Conn.
Bevin Bros. Mfg. Co., East Hampton, Conn. "Barton".
Catasauqua Gong & Stamping Works, Catasauqua, Pa.
East Hampton Bell Co., East Hampton, Conn.
Gong Bell Mfg. Co., East Hampton, Conn.
N. N. Hill Brass Co., East Hampton, Conn.
C. C. Reiter, Canton, Ohio. "Chesswick".
Starr Bros. Bell Co., East Hampton, Conn.
Waterbury Mfg. Co., Waterbury Conn.
Brooklyn, N. Y. "Camia," "Gletieco."
Haskins Glass Co., Wheeling, W. Va.
Jefferson Glass Co., Follansbee, W. Va. "Luceo."
Kirchberger & Co., M., New York, N. Y. (Importers.)

GOOSENECKS.
See Street Fixtures.

GOVERNORS, Engine.
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Lombard Governor Co., Ashland, Mass. (Electric Speed Controllers.)
Lensed Electric Shade Co., New York, N. Y. "Gilbert Reflectors".
Macbeth-Evans Glass Co., Pittsburgh, Pa. "Mazdalite," "Alba", and "Ivalux".
H. G. McFadden & Co., New York. "Emeralite".
Mound Valley Glassware Mfg. Co., Mound Valley, Kas.
Wm. R. Noe & Sons, New York.

GOVERNORS, Water Wheel.
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Holyoke Mach. Co., Worcester, Mass.
Lombard Governor Co., Ashland, Mass.
Lombard & Replogle Engrg. Co., Akron, O.
Ludlow Valve Mfg. Co., Troy, N. Y. "Sturgess".
Woodward Governor Co., Rockford, Ill.

GRAPHITE.
Joseph Dixon Crucible Co., Jersey City, N. J.
Holmes Fibre-Graphite Mfg. Co., Germantown, Pa.
Asbury Graphite Mills, Asbury, N. J.
Chester Graphite Co., Chester Springs, Pa.
Elk Graphite Milling Co., St. Marys, Pa.
International Acheson Graphite Co., Niagara Falls, N. Y.
U. S. Graphite Co., Saginaw, Mich.
Wisconsin Graphite Co., Stevens Point, Wis.

GRAPHITE, Boiler.
Dixon Crucible Co., Joseph, Jersey City, N. J.

GRAPHITED GREASE.
International Acheson Graphite Co., Niagara Falls, N. Y.

GRINDERS, Portable.
See Tools, Portable.

GROUND ANCHORS.
(See Anchors.)

GROUND CLAMPS.
Appleton Electric Co., Chicago.
Benjamin Electric Mfg. Co., Chicago.
Bossert Co., Utica, N. Y.
Federal Sign System (Electric), Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Hart Mfg. Co., Hartford, Conn. "O. K."
High Tension Electrical Specialty Co., Newton, Mass.
Hubbard & Co., Pittsburgh, Pa.
H. T. Paiste Co., Philadelphia, Pa. "Perma-Effect."
Sprague Electric Works, New York, N. Y.
Thomas & Betts Co., New York.
Western Electric Co., New York.
A. A. Electric Mfg. Co., Bridgeport, Conn.
American Metal Works, Philadelphia, Pa.
Art Metal Stamp Co., Newark, N. J.
Blackburn Specialty Co., Cleveland, O.
Cameron Appliance Co., Everett, Mass. "Boston", "Perfect", "McCoy".
Chase-Shawmut Co., Newburyport, Mass.
Cleverly Electrical Works, Philadelphia, Pa. "Forbes."
Fairmount Electric & Mfg. Co., Philadelphia, Pa. "All-in-one," "Vogel."
Gillette Vibber Co., New London, Conn.
H. & H. Mfg. Co., Philadelphia, Pa. "H. & H."
Geo. Heinemann & Co., Philadelphia, Pa. "Six-in-One."
Ideal Clamp Mfg. Co., Brooklyn, N. Y. "Ideal."
Klein & Bro., New York City. "Klein Adjusto."
National Metal Stamping Co., Newark, N. J.
Novelty Electric Co., Philadelphia, Pa. "Flexclamp", "Griptite".

GROUND DETECTORS.
See Instruments.

GROUNDING DEVICES.
See also Ground Clamps.
Bossert & Co., New York, N. Y.
Fargo Mfg. Co., Inc., Poughkeepsie, N. Y.
Blackburn Specialty Co., Cleveland, Ohio.
Fairmount Electric & Mfg. Co., Philadelphia, Pa.
Federal Sign System (Electric) Chicago, Ill.
Brach, L. S., Supply Co., New York.
Hallett Iron Works, Harvey, Ill.
Lord Mfg. Co., Brooklyn, N. Y. "Hydro-Ground".
Paragon Electric Co., Chicago, Ill. (Ground Cones.)
Randolph Insulator Co., Newark, N. J.

GUARDS, Arc Lamps.
See Nets and Guards.

GUARDS, Fan.
Inglis Wire & Iron Works, Detroit, Mich.

GUARDS, Inc. Lamp.
Benjamin Electric Mfg. Co., Chicago, Ill. "Can't Break".
Flexible Steel Lacing Co., Chicago, Ill.
General Elec. Co., Schenectady, N. Y. "G. E."
Harvey Hubbell, Inc., Bridgeport, Conn.
H. W. Johns-Manville Co., New York.
McGill Mfg. Co., Valparaiso, Ind. "Protector", "Bull Dog", "Wager", "Loxon".
Western Electric Co., New York.
Electric Service Supplies Co., Philadelphia, Pa. "New Keystone Guard."
Hamblin & Russell Mfg. Co., Worcester, Mass. "Never Break."
W. N. Matthews & Bro., St. Louis, Mo. "Holdfast".
Morse, Frank W., Boston, Mass.

GUARDS, Locking.
McGill Mfg. Co., Valparaiso, Ind. "Loxon".
Flexible Steel Lacing Co., Chicago, Ill.
Chas. W. Leveridge, New York.
W. N. Matthews & Bro., St. Louis, Mo.

GUARDS, Manhole.
Universal Cable Grip Co., Syracuse, N. Y. "Universal."

GUARDS, Portable Lamp.
Benjamin Electric Mfg. Co., Chicago, Ill. "Protectalite".
General Electric Co., Schenectady, N. Y.
McGill Mfg. Co., Valparaiso, Ind. "Bull Dog", "Standard A", "Security", "National", "Improved Protector", "London".
Electric Service Supplies Co., Philadelphia, Pa. "Keystone".
Frink, I. P., New York, N. Y.
Hamblin & Russell Mfg. Co., Worcester, Mass.
Harvard Electric Co., Chicago, Ill.
Joseph, S., New York, N. Y.
H. Krantz Mfg. Co., Brooklyn, N. Y.
F. H. Lovell & Co., Arlington, N. J.
Morse, Frank M., Boston, Mass.
Novelty Electric Co., Philadelphia, Pa. (Bung Hole Lamp and Guard.)
Overbagh & Ayres Mfg. Co., Chicago, Ill. "Oamco".
P. Sorensen, Brooklyn, N. Y.
Stehlin-Miller & Henes Co., New York. "Rockoff".
Frank H. Stewart Electric Co., Philadelphia, Pa. "Adjustandle".
Taylor, Wm., New York. "Safety".

GUY ANCHORS.
See Anchors.

GUY CLAMPS.
American Steel & Wire Co., Chicago, Ill. "Crosby".
Barnes & Kebert Mfg. Co., New Haven, Conn.
Western Electric Co., New York.
American Hoist & Derrick Co., St. Paul, Minn.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Cincinnati Wire Rope Co., Cincinnati, Ohio.
Cook, Frank B., Chicago, Ill.
Hallett Iron Works, Harvey, Ill.
Hoopes & Townsend Co., Philadelphia, Pa.
Lamson & Sessions Co., Cleveland, Ohio. "Double Grip", "Bull Dog".
M. Lanz & Sons, Pittsburgh, Pa.
Macomber & Whyte Rope Co., Chicago, Ill.
W. N. Matthews & Bro., St. Louis, Mo. "Boltless" and "Two-Bolt".
Michigan Bolt & Nut Works, Detroit, Mich.
National Telephone Supply Co., Cleveland, Ohio.
Newhall Chain Forge & Iron Co., New York. "Trident".
Norton, W. T., West Park, Ohio.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Philadelphia Electric Mfg. Co., Philadelphia.
Schaper Construction Material Co., New York, N. Y.
St. Louis Malleable Casting Co., St. Louis, Mo.
Steel Car Forge Co., Pittsburgh.
Union Elevator & Machine Co., Chicago, Ill.

HAIR DRIERS.
Hamilton-Beach Mfg. Co., Racine, Wis. "Cyclone".
Lindstrom-Smith Co., Chicago, Ill. ("White Cross".)
Shelton Elec. Co., New York, N. Y.
American Electrical Heater Co., Detroit, Mich.
Barker, James, Philadelphia, Pa.
Birtman Electric Co., Chicago, Ill. "Bee".
Electric Mfg. Co., San Francisco.
Fidelity Electric Co., Lancaster, Pa. "Eclipse".
Halliwell & Co., New York, N. Y.
Horn Electric Co., Chicago, Ill.
Wm. Meyer Co., Chicago, Ill.
Royal Specialty Co., Cleveland, Ohio.
Sanax Co., Inc., New York. "Foen."
Shelton Electric Co., New York.
Standard Electric Works, Racine, Wis. ("Arnold".)
Thome, M., Chicago, Ill.
Walters, W. J., Syracuse, N. Y. (Mer-Maid" Hair Drier and Hair Singer.)

HANDLES, Socket.
See Guards, Portable.

HANDLES, Switch (Wood).
For Switch Handles of Rubber or Composition see Insulation. For Fibre Switch Handles see Fibre.
General Electric Co., Schenectady, N. Y.
American Enamel Co., Providence, R. I.
Bogert & Hopper, New York, N. Y.
Detroit Handle Co., Detroit.
E. B. Estes & Sons, New York.
Novelty Turning Co., Norway, Me.
H. A. Stiles & Co., Boston, Mass.
Union Hardware Co., Torrington, Conn.

HANGER BOARDS, Arc Lamp.
Brady Electric Mfg. Co., New Britain, Conn.
Fort Wayne Electric Works, Ft. Wayne, Ind.
General Elec. Co., Schenectady, N. Y. "G. E."
H. T. Paiste Co., Philadelphia, Pa. (Fusible.)
Western Electric Co., New York.
Perkins Electric Switch Mfg. Co., Bridgeport, Conn.
Thompson Elec. Co., Cleveland, Ohio.

HANGERS, Arc Lamp.
See Insulators, Arc Lamp.
Brackets, Arc Lamp.
Pulleys, Arc Lamp.
Pulleys, Cut-out.

HANGERS, Cable.
See Cable Hangers.

HANGERS, Conduit and Moulding.
Appleton Electric Co., Chicago.
Mineraline Electric Co., Chicago, Ill.
Western Electric Co., New York.
Chicago Expansion Bolt Co., Chicago, Ill.

HANGERS, Fixture.
J. Gerden Knight Electric Co., New York, N. Y.
Empire Engineering & Supply Co., New York, N. Y.

HANGERS AND CLAMPS.
Conduit Hangers, Pipe Hangers, Beam Clamps, Pipe Straps.
Appleton Electric Co., Chicago.
F. Bissell Co., Toledo, Ohio. "Security". (Concrete.)
Ohio Brass Co., Mansfield, Ohio.
W. R. Ostrander & Co., New York, N. Y. "Atlas".
Pass & Seymour, Inc., Solvay, N. Y.
Sprague Electric Works, New York.
Steel City Electric Co., Pittsburgh, Pa. ("Fullman" Beam Straps.)
Thomas & Betts Co., New York, N. Y. "Box Hanger".
Appleton Electric Co., Chicago.
W. A. Bonnell Co., New York.
Fee & Mason, New York. "F. & M.", "A. H. C."
S. H. Frallick & Co., Chicago. "Kwikon".
Grabler Mfg. Co., Cleveland, O.
W. F. Irish Electric Co., New York. "Shamrock".
Mathew Lanz & Sons, Pittsburgh, Pa.
E. H. Lovell Co., Arlington, N. J.
Mineraliac Electric Co., Chicago.

HAT CLEANERS, Motor Driven.
Bosso, Paul, Scranton, Pa. "Star".
Fidelity Electric Co., Lancaster, Pa. "Universal".
Saylor Electric Co., Pittsburgh, Pa. (Hat Chuck.)
Schnauffer, Wm. A., New York.

HEADLIGHTS, Automobile.
See Lamps, Automobile.

HEATERS, Electric (Miscellaneous).
See also Flat Irons, Curling Irons, Cooking Devices, Soldering Irons, Hair Driers, Heating Pads.
Current Electric Co., Chicago, Ill.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Dubilier Elec. Co., Inc., New York, N. Y.
Feldman Mfg. Co., New York, N. Y.
General Elec. Co., Schenectady, N. Y. "G. E."
Globe Stove & Range Co., Kokomo, Ind.
Johns-Manville Co., H. W., The, New York City. "Johns-Manville."
Manhattan Electrical Supply Co., New York City. "Mesco."
Rutenber Electric Co., Logansport, Ind.
Simplex Electric Heating Co., Cambridge, Mass. "Simplex."
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. "Westinghouse."
Wirt Co., Philadelphia, Pa.
American Electrical Heater Co., Detroit, Mich. "American Beauty" "Triangle."
Advance Machinery Co., Toledo, Ohio. (Glue Pots.)
Consolidated Car Heating Co., Albany, N. Y.
Geyser Patent Holding Co., Hartford, Conn.
Hotpoint Elec. Heating Co., Ontario, Cal.
Miller Tresing Machine Co., Brockton, Mass.
Pelouse Mfg. Co., Chicago.
Weber, V., and Co., Newark, N. J. "Freas."

HEATER INDICATING RECEPTACLE.
Machen & Mayer Elec. Mfg. Co., Philadelphia.

HEATING PADS AND BLANKETS.
H. W. Johns-Manville Co., New York, N. Y. ("Electrotherm" Heating Pads, Blankets and Caps.)
Simplex Electric Heating Co., Cambridge, Mass.
American Electrical Heater Co., Detroit, Mich.
Hotpoint Elec. Heating Co., Ontario, Cal.
Juniper Electric Products Co., Cleveland, O.
National Electric Co., Chicago. "Neco," "Ozone."
P. & B. Mfg. Co., Milwaukee, Wis.
Phelps Mfg. Co., Detroit, Mich. "Flexo."

HEATING SYSTEMS. Exhaust Steam.
American District Steam Co., North Tonawanda, N. Y.
Simplex Electric Heating Co., Cambridge, Mass.
Evans, Almirall & Co., Chicago, Ill.
Harrison Safety Boiler Works, Philadelphia, Pa.
Michigan Pipe Co., Bay City, Mich.
W. H. Pearce & Co., Chicago, Ill. "Crescent".

HICKIES.
See Studs.
HOISTING MACHINERY, Electric, Mine.
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Chicago.
General Electric Co., Schenectady.
HOISTS.
See Cranes.
HOLDERS, Shade.
See Shade-holders.
HOODS, Street.
See Fixtures, Street.
HOOKS, Insulating.
See Rings.
HOOKS, Sister.
Universal Cable Grip Co., Syracuse, N. Y. "Universal."
Mathew Lanz & Sons, Pittsburgh, Pa.
HORNS, Electric for Automobile and Factory Use.
Lindstrom-Smith Co., Chicago.
Manhattan Electrical Supply Co., New York, N. Y. "Mesco."
Schwarze Electric Co., Adrian, Mich.
American Electric Co., Chicago. "Samson."
Automobile Supply Mfg. Co., Brooklyn, N. Y. "Newtone."
Dean Electric Co., Elyria, Ohio. "Tuto Horn."
Edwards & Co., New York, N. Y. "Dixie."
Electric Auto Horn Co., Pittsburgh, Pa. "Duplex."
Electric Horn & Specialty Co., Utica, N. Y. "Oneida."
Elgin Electrical Mfg. Co., Elgin, Ill.
Elkhart Electro-Corno Co., Elkhart, Ind. "Electro-Corno."
Theo H. Gary Co., New York, N. Y. "Grack-Unicum."
Holtzer-Cabot Electric Co., Brookline, Mass. "Autobia."
Industrial Instrument Co., Foxboro, Mass.
Lovell-McConnell Mfg. Co., Newark, N. J. "Klaxon."
O'Brien Electrophone Co., Hallowell, Me.
Russell Electric Co., Danbury, Conn. "Saxon," "Rapid Fire," "Treco."
Sireno Co., New York, N. Y.
Standard Electric Works, Racine, Wis. "Arnold."
Typhoon Signal Co., Chicago, Ill.
HORSE CLIPPERS.
See Clippers.
HOSE, Rubber.
Fairbanks, Morse & Co., Chicago.
B. F. Goodrich Co., Akron, Ohio.
Peerless Rubber Mfg. Co., New York, N. Y.
HOUSES, Pole or Pilot.
F. Bissell Co., Toledo, Ohio. "Security."
Central Telephone & Electric Co., St. Louis, Mo.
Cook, Frank B., Chicago, Ill.
HUSKS.
See Spinnings.
HYDROMETERS AND SYRINGES.
E. Marcuson, New York, N. Y. "Withan."
Philadelphia Thermometer Co., Philadelphia, Pa.
Queen-Gray Co., Philadelphia, Pa.
Storage Battery Supply Co., New York, N. Y. "Reliance."
C. J. Tagliabue Mfg. Co., New York.
Taylor Bros. Co., Rochester, N. Y.
Turner Brass Works, Sycamore, Ill.
Charles A. Vuille, Huntingdon, Pa.
ICE MACHINES.
See Refrigerators.
IMPREGNATING COMPOUNDS.
See Varnish.
IMPREGNATORS.
See Driers.
INCUBATORS, Electric.
Cyphers Incubator Co., Buffalo. "Electrobator" "Electrohens" "Electroplane."
Electric Mfg. Co., New Orleans.
Electric Specialty Co., Salt Lake City.
Weber, V., and Co., Newark, N. J. "Freas."
INDICATORS, Polarity.
See Indicators, Testing.
INDICATORS, Speed.
See Tachometers.
INDICATORS, Steam Engine.
American Steam Gauge & Valve Co., Boston, Mass.
Ashcroft Mfg. Co., New York, N. Y.
Lippincott, S. S. & S. Co., Newark, N. J.
Jas. L. Robertson & Sons, New York, N. Y.
Schaeffer & Budenberg Mfg. Co. Brooklyn, N. Y.
Star Brass Mfg. Co., Boston
United Electric Apparatus, Co., Boston, Mass.
INDIRECT LIGHTING FIXTURES.
See Fixtures, Indirect.
INDUCTORS AND EJECTORS.
American Injector Co., Detroit, Mich. "U. S."
Hancock Inspirator Co., New York, N. Y.
Hayden & Derby Mfg. Co., New York, N. Y. "Metropolitan."
Penberthy Injector Co., Detroit, Mich.
INNER GLOBES.
See Globes, Arc Light.
INSTRUMENTS, Power Factor Meters, Recording Meters, Frequency Meters, Ground Detectors, Synchroscopes, Laboratory Apparatus.
Badt-Westburg Electric Co., Inc., Chicago.
Bristol Co., Waterbury, Conn. (Recording.)
Esterline Co., The, Indianapolis, Ind.
Fort Wayne Electric Works, Ft. Wayne, Ind. "Wood."
General Electric Co., Schenectady, N. Y. "Thompson."
Hoyt Electrical Instrument Works, Penacook, N. H.
H. W. Johns-Manville Co., New York. ("Victor" Combination.)
Manhattan Electrical Supply Co., New York, N. Y. (Polarity Indicators.)
Roller-Smith Co., New York.
Sangamo Electric Co., Springfield, Ill.
Schweitzer & Conrad, Inc., Chicago.
Wagner Elec. Mfg. Co., St. Louis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Co., Waverly Park, Newark, N. J.
Automatic Electric Co., Chicago, Ill. (Condensers.)
James G. Biddle, Philadelphia, Pa. (Importer "Siemens & Halske".)
Century Electrical Co., Syracuse, N. Y. (Field Tester.)
Dongan Electric Mfg. Co., Detroit, Mich.
T. H. Du Vivier, New York, N. Y. (Importer "Richard" Recording.)
Eager Electric Co., Watertown, N. Y.
Eldredge Electric Mfg. Co., Springfield, Mass.
Holcomb & Hoke Mfg. Co., Indianapolis, Ind.
Hoskins Mfg. Co., Detroit, Mich.
International Instrument Co., Cambridge, Mass.
Industrial Instrument Co., Foxboro, Mass.
Jewell Elec. Inst. Co., Chicago, Ill.
Keystone Elec. Inst. Co., Philadelphia, Pa.
Norton Electrical Instrument Co., Manchester, Conn.
Pignolet, L. M., New York, N. Y.
Queen-Gray Co., Philadelphia, Pa.
Reliance Instrument Co., Chicago, Ill.
Robert Instrument Co., Detroit, Mich.
Steel Glass Co., Philadelphia, Pa. (Ground Detectors.)
Thwing Instrument Co., Philadelphia, Pa.
Triplett Meter Co., Bluffton, O.
INSTRUMENTS, Pole Measuring.
United Electric Co., Marion, O. "Vertascope".
INSTRUMENTS, Switchboard.
See Ammeters, and Voltmeters, Wattmeters, Frequency Indicators.
INSTRUMENTS, Testing, Electroscopes, Galvanometers, Wheatstone Bridges, Testing Sets, Ohmmeters, Condensers, Dynamometers.
Electric Controller & Mfg. Co., Cleveland, O. (Fault Finder.)
Leeds & Northrup Co., Philadelphia, Pa. (Fault Finders, Cable Testers and Laboratory Instruments.)
Metropolitan Engineering Co., New York City.
Mineralac Electric Co., Chicago, Ill. (Portable Cable Testing Sets, Electroscopes, Phase Rotation Indicators.)
Roller-Smith Co., New York.
States Co., Hartford, Conn. (Meter Testers.)
Thompson-Levering Co., Philadelphia, Pa.
Schweitzer & Conrad, Inc., Chicago.
Western Electric Co., New York.
James G. Biddle, Philadelphia, Pa. (Importer "Siemens & Halske".)
J. H. Bunnell & Co., New York.
Century Electrical Co., Syracuse.
Chemelectric Co., Chicago. (High voltage and fault detectors.)
Electric Specialty Mfg. Co., Cedar Rapids, Iowa. (Wireless Cable Testers.)
L. M. Ericsson Telephone Mfg. Co., Buffalo, N. Y. (Lineman's ...)
Foote, Pierson & Co., New York.
Green Electric Co., W., New York.
W. & L. E. Gurley, Troy, N. Y.
Keystone Electrical Instrument Co., Philadelphia, Pa.
Manufacturers and Inventors' Electric Co., New York, N. Y. "Troy".
Marcuson, E., New York, N. Y. (Portable Testing Batteries.)
Marshall, Wm., New York, N. Y.
W. N. Matthews & Bro., St. Louis, Mo. (Fault Finders.)
Wm. J. Murdock Co., Chelsea, Mass.
Fred'k Pearce Co., New York, N. Y.
Queen-Gray, Philadelphia, Pa.
Wireless Cable Tester Co., Cedar Rapids Iowa.
INSTRUMENTS, Time Measuring.
M. J. Silberberg, Chicago.
INSTRUMENTS, Wireless.
See Wireless Apparatus.
INSULATED WIRE CONNECTORS.—N. E. C.
General Electric Co., Schenectady, N. Y.
Universal Electric Stage Lighting Co., New York, N. Y. "Kliegl Bros."
U. S. K. M. Co., New York.
INSULATING CEMENTS.
Dickinson Mfg. Co., Springfield, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Flintkote Mfg. Co., New York, N. Y.
Walpole Tire & Rubber Co., Walpole, Mass.
INSULATING MACHINERY, Wire Covering Machinery.
New England Butt Co., Providence, R. I.
American Insulating Machinery Co., Philadelphia, Pa.
INSULATING PAINTS AND COMPOUNDS.
Chicago Mica Co., Valparaiso, Ind. "Champion."
Dickinson Mfg. Co., Springfield, Mass.
General Bakelite Co., New York.
H. W. Johns-Manville Co., New York, N. Y. "Phoenix". "J. M."
McGill Mfg. Co., Valparaiso, Ind. ("Crescent Chatterton".)
Mica Insulator Co., New York, N. Y. "M. I. C." "Linolac".
Mitchell-Rand Mfg. Co., New York. "B. S." "Electric Black".
Packard Electric Co., Warren, Ohio.
Standard Paint Co., New York, N. Y. "P. & B."
Sherwin-Williams Co., Cleveland, Ohio.
Standard Underground Cable Co., Pittsburgh, Pa. "Oxite".
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
American Mica Co., Newton Lower Falls, Mass. "A. M. C."
Benolite Co., Pittsburgh, Pa.
Berry Bros., Detroit, Mich.
L. S. Brach Supply Co., New York, N. Y. "Victolac".
Emil Calman & Co., New York, N. Y.
Candy & Co., Chicago, Ill. "Faultless".
Condensite Co. of America, Bloomfield, N. J.
Condensite Co. of America, Glen Ridge, N. J.
Dielectric Co. of America, Belleville, N. J.
Dielectric Mfg. Co., St. Louis.
John C. Dolph Co., Newark, N. J. "Jayseedee."
Eagle Paint & Varnish Co., Pittsburgh, Pa.
Flintkote Mfg. Co., New York, N. Y. "Rex Elec. Insulating Compound".
Franklin Co., Bound Brook, N. J. "B. & B."
Insulatine Co., New York, N. Y. "Insulatine Flexible Compound."
Insulating Materials Co., Detroit, Mich.
Lowe Bros. Co., Dayton, O.
Walpole Tire & Rubber Co., Walpole, Mass. "Union Splice", "Neponset", "Maschemco", "Enamelac", "Walpole", "Armalac".
Mineralac Electric Co., Chicago, Ill.
Pias-Mica Co., Yonkers, N. Y.
P. & M. Co., Chicago, Ill. "A. C."
Raven Mining Co., Chicago, Ill. "Gilsonite" (Elaterite), "Kapac".
Standard Asphalt & Rubber Co. ("Carco" Asphaltic), Chicago, Ill.
Standard Varnish Works, New York.
Standard Wax & Import Co., New York, N. Y.
Sterling Varnish Co., Pittsburgh, Pa.
Toch Bros., New York. "R. I. W."
E. T. Trotter & Co., Brooklyn, N. Y.
Voltax Co., New York.
K. S. Van Kenerits & Co., New York, N. Y. (Importers "Cosmos".)
Warren Chemical & Mfg. Co., New York. (Asphaltic.)
E. A. Wilhelmi Co., New York, N. Y.
Williams, F. M., Brooklyn, N. Y.
INSULATION, Overhead.
See Line Material.
INSULATION, Hard Moulded Composition and Rubber. Bushings, Battery Jars, Battery Jar Covers, Receiver Shells, Telephone Mouthpieces, Trolley Insulators, Socket Keys, Switch Handles, Sheet-Rod-Tube.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Cutter Co., Geo., So. Bend, Ind.
Dickinson Mfg. Co., Springfield, Mass. "Stern-Condensite." "Sternoid." "Standard."
Electrose Mfg. Co., Brooklyn, N. Y. (Composition.)
General Bakelite Co., New York.
General Insulate Co., Brooklyn, N. Y.
Goodrich Co., Akron, Ohio.
Hemming Mfg. Co., Garfield, N. J. "Tegit", "Gummon", "Hemit" Composition.
Johns-Manville Co., H. W., New York City.
Mitchell-Rand Mfg. Co., New York City. "Leverite" "MR-40" "MR-50."
Paiste, H. T., Co., Philadelphia, Pa.
Pass & Seymour, Inc., Solvay, N. Y.
Scranton Button Co., Scranton, Pa. "Composition".
Westinghouse Electric & Mfg Co., East Pittsburgh, Pa.
Asbestos Wood Co., Nashua, N. H.
Continental Fibre Co., Newark Del. "Bakelite-Dilecto."
Formica Insulation Co., Cincinnati, Ohio.
Johns Pratt Co., Hartford, Conn. "J. P. Bakelite."
Lovering Co., C. P., East Cambridge, Mass.
Mineralac Cable Cleats Co., Chicago, Ill.
Northern Industrial Chemical Co., Boston, Mass. "Roxite."
Steel City Elec. Co., Pittsburgh, Pa. "Universal."
INSULATOR PINS.
See Pins, also Brackets.
INSULATORS, Arc Lamp. (Insulated Hangers.)
Albert & J. M. Anderson Mfg. Co., Boston, Mass
Geo. Cutter Co., South Bend, Ind.
General Electric Co., Schenectady, N. Y.
H. W. Johns-Manville Co., New York, N. Y.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Fletcher Mfg. Co., Dayton, O.
Line Material Co., S. Milwaukee Wis.
Macallen Co., Boston, Mass.
Philadelphia Electric Mfg. Co. Philadelphia.
Thos. Wrigley & Co., Chicago, Ill.
INSULATORS, Canopy.
(See Canopy Insulators.)
INSULATORS, Glass.
The Brookfield Glass Co., New York, N. Y. "Combination Safety", "Mershon", "Barclay", "Brown", "Crown", "O'Brien", "Columbia", "Jumbo", "Edison".
General Electric Co., Schenectady, N. Y.
Hemingray Glass Co., Covington, Ky. "Triple Petticoat", "Muscle Type", "Prove Type"
Locke Insulator Mfg. Co., Victor, N. Y. "Triple Petticoat".
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Haskins Glass Co., Wheeling, W. Va.
INSULATORS, High Voltage.
Electrical Engineers' Equipment Co., Chicago, Ill.
Delta-Star Electric Co., Chicago, Ill.
Dickinson Mfg. Co., Springfield, Mass.
General Devices & Fittings Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
H. W. Johns-Manville Co., New York, N. Y. "J. M."
Locke Insulator Mfg. Co., Victor, N. Y. "Victor".
Ohio Brass Co., Mansfield, Ohio
R. Thomas & Sons Co., East Liverpool, Ohio. "Boch".
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. "Nikonow".

Fairmount Electric & Mfg. Co. Philadelphia, Pa.
Pittsburgh High Voltage Insulator Co., Derry, Pa.

INSULATORS, Lava.
See Lava.

INSULATORS, Porcelain.
See Porcelain.

INSULATORS, Pull Chain.
Arrow Electric Co., Hartford, Conn.
Harrigan T. M., Woodstock, Vt

INSULATORS, Street Fixtures.
See Street Fixtures, Street. . .

INSULATORS, Tree.
(See Tree Insulators.)

INSULATORS, Wood.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Aerial Conduit Co., Wabash, Ind.
Mineralac Electric Co., Chicago.

INSURANCE.
Insurance Utilities Indemnity Co., St. Louis, Mo.

IRIDIO-PLATINUM, Wire and Sheet.
Baker & Co., Newark, N. J.

IRON AND STEEL, For Armature and Magnet Punchings.
American Sheet & Tin Plate Co., Pittsburgh, Pa. "American Armature", "Apollo", "Pole Face", "U. S. Electrical".
Edward E. Cary Co., New York, N. Y. (Importers.)
American Rolling Mill Co., Middletown, Ohio
Follansbee Brothers & Co., Follansbee, W. Va.

IRONS, Soldering and Branding.
See Soldering Irons.

JACK STRAPS.
See Linemen's Tools.

JARS, Battery (Glass.)
Cumberland Glass Mfg. Co., Bridgeton, N. J.
Gillinder & Sons (Franklin Flint Glass Works), Philadelphia, Pa.
Illinois Glass Co., Chicago, Ill
Lovering Co., C. P., East Cambridge, Mass.
Mississippi Glass Co., New York.
Whitall-Tatum Co., Philadelphia.
Whitney Glass Works, Philadelphia, Pa.

JEWELS, for Instrument Bearings.
American Oil & Supply Co., Newark, N. J.
Diamond Cupped Bearing Co., New York, N. Y.
Fisher & Vinal Jewel Co., Waltham, Mass.
W. W. Mildrum, East Berlin, Conn.
H. E. Oppenheimer & Co., New York, N. Y.
John Wennstrom's Sons Co., Suffern, N. Y.
John Worley, Waltham, Mass.

JOINTS, Cable.
Dossert & Co., New York. "Dossert."
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. "Knuckle Joint."

JOINTS, Cable-Splicing.
See Cable Splicing Joints.

JOINTS, Fixture Insulating.
Faries Mfg. Co., Decatur, Ill.
Federal Sign System, (Electric), Chicago. "Dielite".
Thomas & Betts Co., New York.
Trumbull Electric Mfg. Co., Plainville, Conn.
Wirt Co., Philadelphia, Pa. "Di-El-Ite".
Barnes Bros., Detroit, Mich. "Detroit."
Stanley G. Flagg & Co., Philadelphia, Pa. "Flagg."
Gier & Dall Mfg. Co., Lansing, Mich. "Lansing."
Johns-Pratt Co., New York City. "T. & B."
Macallen Co., Boston, Mass.

JUNCTION BOXES.
See Boxes.

KEYS, SOCKET, Detachable.
(For regular socket keys, see Insulation, Moulded.)

KITCHEN CABINETS.
Federal Sign System, (Electric), Chicago. "Federal".

KITS, Tool.
See Tools, Linemen's.

KNIFE SWITCHES.
See Switches, Knife.

KNOBS, Porcelain.
See Porcelain.

LACQUER, Lamp.
See Coloring.

LACQUER, Metal.
General Bakelite Co., New York.
W. L. Barrett & Co., Chicago, Ill.
Celluloid Zapon Co., New York.
James B. Clay & Co., Chicago, Ill.
Egyptian Lacquer Mfg. Co., New York.
C. E. Franche & Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Lacquer Radiant Co., Philadelphia, Pa.
G. J. Nikolas & Co., Chicago, Ill.
W. Ainsner & Co., New York.

LAMPS, Arc.
Albert & J. M. Anderson Mfg. Co., Boston, Mass. ("Monarch" Enclosed.)
Central Electric Co., Chicago, Ill.
Fort Wayne Electric Works, Fort Wayne, Ind. ("Wood" Enclosed.)
General Electric Co., Schenectady, N. Y. Enclosed, Flame, Series Luminous, Intensified, Ornamental Series Luminous, Luminous Arc Headlights.
Universal Electric Stage Lighting Co., New York, N. Y. "Kliegl Bros."
Western Electric Co., New York. ("Hawthorn" Flaming and "Solaris" "Hawthorn" Miniature.)
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. (Enclosed and Magnetite.)
Adams-Bagnall Electric Co., Cleveland, O.
American Arc Lamp Co., Kalamazoo, Mich. ("Northall," "Lea" Enclosed.)
Archer & Baldwin, New York.
Aurora Electric Co., Aurora, Ind. (Miniature.)
Eclipse Electric Arc Light Co., New York. (Miniature.)
Economy Electric Co., Brooklyn, N. Y. (Enclosed.)
Helios Mfg. Co., Philadelphia, Pa. ("Continental" Enclosed and Flaming.)
Hirschberg Co., H. M., New York, N. Y. (Import "Siemens" Flaming.)
Hunt & McCree, New York. ("Lustrelite" Enclosed.)
Imperial Electric Mfg. Co., New York. (Enclosed.)
Kandem Electric Co., Inc., New York. ("Excello.")
C. L. Kiewert Co., Milwaukee, Wis. (Import "Aurora" and "Alba" Flaming.)
Lord Mfg. Co., Brooklyn, N. Y. ("Luminator" Flaming and "Heany" and "Luminet" Enclosed.)
Main Electric Co., New York. (Importers Flaming.)
Philadelphia Electrical & Mfg. Co., Philadelphia, Pa. "Tungsten Arc".
Radio Reflector Co., New York. (Enclosed.)
Scott Electrical Co., Newark, N. J. (Flaming.)
Stillwell Van Demark Co., New York. ("Stilvan" Miniature.)
C. J. Toerring Co., Philadelphia, Pa. (Flaming and Enclosed.)
Universal Elec. Stage Lighting Co., New York. "Kliegl."
Volkmer Electrical Co., New York. ("Daylight" Enclosed.)
Warner Lamp Co., Davenport, Iowa.
Wohl & Co., M. J., Brooklyn, N. Y. "Economy." "Sunray."

LAMPS, Automobile, Electric, Head, Side, Tail.
General Electric Co., Schenectady, N. Y.
Adams & Westlake Co., Chicago, Ill. "Adlake."
Apple Electric Co., Dayton, Ohio.
Avery Portable Lighting Co., Milwaukee. ("Electrobola" Headlight.)
Badger Brass Mfg. Co., Kenosha, Wis.
A. S. Campbell Co., Boston, Mass. "Cello."
Chicago Auto Lamp Works, Chicago, Ill.
C. Cowles & Co., New Haven, Conn.
R. E. Dietz Co., New York.
Edmunds & Jones Mfg. Co., Detroit, Mich.
Elgin Electrical Mfg. Co., Elgin, Ill.
English & Mersick Co., New Haven, Conn.
Fowler Lamp & Mfg. Co., Chicago, Ill.
Gray & Davis, Amesbury, Mass.
Guide Motor Lamp Mfg. Co., Cleveland, Ohio.
C. M. Hall Lamp Co., Detroit.
Hartman Electrical Mfg. Co., Mansfield, Ohio.
Miller-Sprague-Waldo Mfg. Co., Detroit, Mich. "Britelyte."
Joseph F. O'Brien Co., New York.
Scoville & Peck Co., New Haven, Conn.
Silvey Electric Co., Dayton, O.
Vesta Accumulator Co., Chicago.
White Diamond Co., Indianapolis, Ind.
White Mfg. Co., Bridgeport, Conn.

LAMP CHANGERS OR REPLACERS.
McGill Mfg. Co., Valparaiso, Ind. "Bates."
W. N. Matthews & Bro., St. Louis, Mo. "Easy".
Frank W. Morse, Boston, "Handy."
State Elec. Mfg. Co., Boston. "Tite-Grip."

LAMP GUARDS.
See Guards.

LAMPS, Incandescent, Miniature, Carbon Filament, Metal Filament.
Central Electric Co., Chicago, Ill.
Deuth & Co., New York, N. Y.
Independent Lamp and Wire Co., New York.
Laco-Phillips Co., New York.
Mannweiler Co., A. C., Ft. Wayne, Ind.
National Lamp Works of General Electric Company—the following member divisions:
Chicago Federal Miniature Division, Chicago, Ill.
New York Federal Miniature Division, New York, N. Y.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Aetna Electric Co., New York.
American Electric Lamp Co., New York.
American Miniature & Decorative Lamp Co., New York. "Ever Ready."
Dueth & Co., New York City.
Eclipse Inc. Lamp Co., Toledo, Ohio.
Elblight Co. of America, New York (Special Decorative.)
Electro Importing Co., New York. (Importers.)
Farkas Tungsten Lamp Co., Bloomfield, N. J.
Franco-American Electric Novelty Co., New York. (Importers.)
Gudeman & Co., New York. (Importers.)
Howard Miniature Lamp Co., Newark, N. J. (Metallic or Carbon Filament.)
Industrial Novelty Co., Chicago, Ill. (Importers.)
H. J. Jaeger Co., Hoboken, N. J.
H. W. McCandless & Co., New York. "Empire."
Novelty Incandescent Lamp Co., Emporium, Pa.
Portable Elec. Safety Light Co., Newark, N. J.
P. W. Electric Co., Toledo, O.
F. J. Rooney Lamp Co., Hoboken, N. J.
Standard Elec. Novelty Co., Chicago, Ill.
Vacuum Glass Co., Lynn, Mass.

LAMPS, Incandescent, Carbon Filament, Metal Filament, Tungsten, Mazda, Tantalum, Gem, Series, Regulating, Turndown, Glower, Reflector, Meridian.
D. & M. Lamp & Lighting Co., New York City
Deuth & Co., New York City.
Edison Lamp Works of General Electric Co., Harrison, N. J.
H. W. Johns-Manville Co. New York, N. Y. "Linolite."
Independent Lamp & Wire Co., New York.
Kentucky Electrical Co., Inc., Owensboro, Ky.
Laco-Phillips Co., New York.
Lux Manufacturing Co., New York
Metalyte Co., Inc., New York City.
National Quality Lamp Works of General Electric Company comprising the following member divisions, [All types and sizes Mazda (drawn-wire), tantalum, gem and carbon lamps except where otherwise indicated.]
American Electric Lamp Division, Central Falls, R. I.
The Banner Electric Division, Youngstown, Ohio.
Boston-Economy Lamp Division, Danvers, Mass. (Refilled Carbon and Tungsten Filament Lamps.
Bryan-Marsh Division, Central Falls, R. I.
Bryan-Marsh Division, Chicago, Ill.
The Buckeye Electric Division, Cleveland, Ohio.
Chicago Federal Miniature Division, Chicago, Ill.
Colonial Electric Division, Warren, Ohio.
The Columbia Lamp Division St. Louis, Mo.
Economical Electric Lamp Division, New York, N. Y. (Turn-down lamps—Mazda and carbon).
The Fostoria Incandescent Lamp Division, Fostoria, Ohio.
General Incandescent Lamp Division, Cleveland, Ohio
Monarch Incandescent Lamp Division, Chicago, Ill.
Munder Electric Division, Central Falls, R. I.
New York Miniature Division, New York, N. Y.
Packard Lamp Division, Warren Ohio.
The Peerless Lamp Division Warren, Ohio.
Shelby Lamp Division, Shelby Ohio.
Standard Electric Division Warren, Ohio.
The Sterling Electric Lamp Division, Warren, Ohio.
Sunbeam Incandescent Lamp Division, New York, N. Y.
Sunbeam Incandescent Lamp Division, Chicago, Ill.
Zukui Electric Lamp Division, Cleveland, Ohio. (Carbon Lamps.)
New York Electric Lamp Co., New York. ("Regent," Metal Filament and "The Best" Carbon Filament.)
Western Electric Co., New York.
Westinghouse Lamp Co., Bloomfield, N. J.
Aetna Electric Co., New York ("Mazda" Drawn Wire.)
Aladdin Electric Co., Chicago.
American Electric Lamp Co., New York.
American "Z" Electric Lamp Co., New York. (Metal Filament.)
Capital Electric Co., Denver, Colo. "Hall".
Consolidated Electric Lamp Co., Danvers, Mass. ("Champion" Carbon Filament.)
Eastern Electric Lamp Co., Boston, Mass.
Eclipse Inc. Lamp Co., Toledo, Ohio.
Elblight Co. of America, New York. (Decorative Lamps and Cables.)
Electrical Accessories Co., New York. (Importers "Justram" Tungsten.)
Farkas Tungsten Lamp Co., Bloomfield, N. J.
Fensterer & Rube, New York (Import "Gratzin" Tungsten.)
Franklin Electric Mfg. Co., Hartford, Conn.
Gilmore Electric Co., S. Boston, Mass.
Hoischer Elect. Mfg. Co., Warren, Ohio. "Model".
Hygrade Incandescent Lamp Co., Danvers, Mass.
Liberty Electric Mfg. Co., Pittsburgh, Pa.
Nernst Lamp Co., Pittsburgh, Pa. (Glower.)
New England Lamp Co., Malden, Mass.
Novelty Inc. Lamp Works, Emporium, Pa. "Any Angle" "Elk".
Planet Incandescent Lamp Co., Inc., New York City.
F. J. Rooney Lamp Co., Hoboken, N. J. (Sun-Star Turndown and "World" Carbon.)
Straight Filament Lamp Co., New York. (Tube.)
Union Light & Supply Co., Chicago.
U. S. Inc. Lamp Co., St. Louis.
Vacuum Glass Co., Lynn, Mass. "Lowvolt".

LAMPS, Incandescent, Renewed.
National Lamp Works of General Electric Company—the following member divisions:
Boston-Economy Lamp Division, Danvers, Mass.

Aladdin Electric Co., Warren, Ohio.
Anchor Lamp Co., New York.
Bay State Lamp Co., Danvers, Mass. "Eclipse". "Bay State".
Eagle Lamp Co., Danvers, Mass.
Essex Lamp Co., Danvers, Mass.
Holscher Electrical Mfg. Co., Warren, Ohio. "Reliance".
International Electric Co., Danvers, Mass.
Lynn Incandescent Lamp Co., Lynn, Mass.
Lyons Electric Co., Newark, N. J.
Phoenix Electric Co., Warren, Ohio.
Re-New Lamp Co., Boston, Mass. "Maiden."
Safety Electric Co., Chicago, Ill.

LAMPS, Photo Engraving.
General Electric Co., Schenectady, N. Y.
Universal Electric Stage Lighting Co., New York, N. Y. "Kliegl Bros."
Adams-Bagnall Electric Co., Cleveland, Ohio.
C. J. Bogue Electric Co., New York.
Eastman Kodak Co., Rochester, N. Y. "Aristo."
Wm. H. Havill, Chicago, Ill.
Macbeth Arc Lamp Co., Philadelphia, Pa.
New York Engravers' Supply Co., New York.
A. T. Thompson & Co., Boston.
C. J. Toerring Co., Philadelphia.
Wohl & Co., M. J., Brooklyn, N. Y. "Chrome-Actinic."

LAMPS, Portable.
See Guards, Portable Lamp, also Lamps, Trouble.

LAMPS, Trouble, Automobile, Portable, Hand.
Aladdin Lamp Corp., New York City.
Manhattan Electrical Supply Co., New York. "Mesco."
McGill Mfg. Co., Valparaiso, Ind.
Metal Specialties Mfg. Co., Chicago, Ill.
American Enamel Co., Providence, R. I. "Britelite."
American Ever Ready Co., New York.
Frank W. Morse, Boston, Mass.
Providence Electric Mfg. Co., Providence, R. I. "Nitelite."

LAMPS, Vapor and Vacuum Tube.
Cooper Hewitt Electric Co., Hoboken, N. J. (Mercury Vapor and Quartz Tube.)
General Electric Co., Schenectady.

LANTERNS.
Central Telephone & Electric Co., St. Louis, Mo.
Federal Sign System (Electric), Chicago.
Manhattan Electrical Supply Co., New York City.
Metal Specialties Mfg. Co., Chicago.
Merchant Engineers Corporation, New York City.
The Usona Mfg. Co., Inc., Toledo, Ohio.
The Usona Mfg. Co., Inc., New York, N. Y.

LAUNDRY MACHINERY (Electrically operated.)
Simplex Electric Heating Co., Cambridge, Mass.
American Ironing Machine Co., Chicago, Ill. "Simplex."
American Laundry Machinery Co., Rochester, N. Y.
Barnes & Payton, Troy, N. Y.
National Laundry Machinery Co., Chicago, Ill.
National Marking Machine Co., Cincinnati, Ohio.
Steel Roll Machine Co., Chicago, Ill. "Clean Linen."
S. M. Supplies Co., Boston, Mass. (Marking Machines.)
Troy Laundry Machinery Co., Chicago, Ill.

LAVA.
American Lava Co., Chattanooga, Tenn. "Alco."
Colonial Mfg. Co., Chattanooga, Tenn.
M. Kirchberger & Co., New York. "Crescent."
Novelty Burner Co., Chattanooga, Tenn.
D. M. Steward Mfg. Co., Chattanooga, Tenn. "Lavite."

LEATHER MACHINERY.
See Shoe and Leather Machinery.

LEATHER WASHERS.
See Washers, Leather.

LETTER BOXES.
Manhattan Electrical Supply Co., New York. N. Y.
Western Electric Co., New York.
Francis Hall & Son, New York.

LICENSE NUMBERS, Illuminated.
See Numbers.

LIFTING MAGNETS.
See Magnets, Lifting.

LIGHTERS, Cigar.
See Cigar Lighters.

LIGHTERS, Gas, Electric Torches for hand use.
Stanley & Patterson, New York. "Matchless."
Adjustable Lighter Co., Newton, Mass.
American Ever Ready Co., New York, N. Y.
A. L. Bogart, New York, N. Y.
Edward E. Cary Co., New York.
C. Cowles & Co., New Haven, Conn.
Electric Goods Mfg. Co., Canton, Mass.
Loomis Specialty Co., Minneapolis, Minn.
Wm. Roche, Jersey City, N. J.
Standard Sheet Metal Co., Passaic, N. J. "Rayflex."
Universal Novelty Co., New York. "Aladdin."

LIGHTING PLANTS.
Crocker-Wheeler Co., Ampere, N. J.
Fairbanks-Morse Co., Chicago.
General Electric Co., Schenectady, N. Y.
Mechanical Appliance Co., Milwaukee, Wis.
American Battery Co., Chicago.
Apple Electric Co., Dayton, Ohio.
Carlisle & Finch Co., Cincinnati, Ohio.
Dayton Electrical Mfg. Co., Dayton, Ohio.
Dealers Electric Lighting Co., Chicago. "Jupiter" plants.
Ideal Lighting Co., Davenport, Iowa.
Inst. Lighter Co., Columbus, Ohio.
Main Elec. Mfg. Co., Pittsburgh, Pa.
Moon Mfg. Co., Chicago, Ill.
National Meter Co., New York.
New Britain Machine Co., New Britain, Conn. ("Chase" Lighting Outfits.)
Richardson Engineering & Mfg. Co., Hartford, Conn.
Rochester Electric Motor Co., Rochester, N. Y. "Service."
Silvey Electric Co., Dayton, O.
Chas. A. Strelinger Co., Detroit, Mich. ("Brush" Lighting Set.)
Warner Lamp Co., Davenport, Iowa.

LIGHTNING ARRESTERS for Lighting and Power Circuits.
Anderson Mfg. Co., Albert & J. M., Boston, Mass. "Ajax."
Delta-Star Electric Co., Chicago. "Horn Gap."
General Electric Co., Schenectady.
Ohio Brass Co., Mansfield, Ohio.
Schweitzer & Conrad, Inc., Chicago.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. "Wurts."
Electric Service Supplies Co., Philadelphia, Pa., "Garton-Daniels."
Lord Mfg. Co., Brooklyn, N. Y. "Multi-Vapo-Gap", "Shaw".
Railway & Industrial Engineering Co., Pittsburgh, Pa.

LIGHTNING ARRESTERS, for Telephone Circuits.
Central Electric Co., Chicago, Ill.
Western Electric Co., New York.
L. S. Brach Supply Co., New York.
Chance Mfg. Co., Centralia, Mo. "Skyrocket."
Foote-Pierson Co., New York City.
Minnesota Electric Co., Minneapolis, Minn. "Chapman."
National Electric Specialty Co., Toledo, Ohio. "Vac-M."
Universal Carbon Co., Dundee, Ill.
Viaduct Elec. Co., New York City.

LIGHTS, Automobile.
See Outfits, also Lamps, Automobile.

LIGHTS, Desk, Desk Lights, Wall Brackets, Desk Clamps.
Faries Mfg. Co., Decatur, Ill.
Federal Sign System (Electric), Chicago, Ill. "Universal."
Franks Mfg. Co., Rock Island, Ill.
H. W. Johns-Manville Co., New York, N. Y. "Linolite."
Stanley & Patterson, New York. "Sunlight."
St. Louis Brass Mfg. Co., St. Louis, Mo.
Usona Mfg. Co., New York City ("Lynne.")
Wheeler Reflector Co., Boston.
J. Alexander Mfg. Co., New York. (Ball Bearing.)
American Brass & Copper Co., New York. (Desk Lamp.)
American Electric Co., Chicago, Ill. "More-Light." "Read-Easy." "All-Ways."
Coder & Missic, Mariner Harbor, N. Y.
Dale Co., The, New York, N. Y.
C. G. Everson & Co., Chicago, Ill.
Peter Forg, Somerville, Mass.
Frantz Mfg. Co., Sterling, Ill. ("Best-Yet" Orchestra Shade.)
Gall-Webb Mfg. Co., Buffalo, N. Y.
Handy Light Co., Cincinnati.
W. S. Hawker, Dayton, Ohio. "Universal."
Klemm & Co., Philadelphia, Pa.
McFaddin & Co., H. G. New York, N. Y. "Emeralite."
McLeod, Ward & Co., New York. ("Ward" Orchestra) "Comfort" Bed Reading Lamp ("Kinsman" Desk.)
McKenna Bros. Brass Co., Pittsburgh, Pa. (Desk Stands.)
Frank W. Morse, Boston, Mass.
Oliver Electric Co., Philadelphia, Pa. "Flexilite." "Equipoise."
Overbagh & Ayres Mfg. Co., Chicago, Ill. "Oamco."
Paragon Electric Co., Chicago, Ill.
Patterson Tool & Supply Co., Dayton, Ohio.
A. C. Scribner, Gloversville, N. Y.
John J. Waldman, New York. ("Jones" Desk Clamp.)
Wells Light Mfg. Co., Jersey City, N. J. "Wallworks."
O. C. White Co., Worcester, Mass.
J. H. White Mfg. Co., Brooklyn, N. Y. "Zenith."
Williamson Co., A. L., New York, N. Y. "Flexilvte."

LIGHTS, Stage, Bunch, Foot, Spot, Strip.
F. Bissell Co., Toledo, Ohio. "Security."
Campbell Electric Co., Lynn, Mass.
Condit Elect'l Mfg. Co., Boston.
General Electric Co., Schenectady, N. Y.
Universal Elec. Stage Lighting Co., "Kliegl Bros.," New York.
Am. Reflector & Ltg. Co., Chicago, Ill.
Electric Mfg. Co., New Orleans.
Electric Stage Lighting Co., Chicago, Ill.
I. P. Frink, New York.
J. H. Hallberg, New York.
Kansas City Scenic Co., Kansas City, Mo.
C. L. Newton, New York.
Overbagh & Ayres Mfg. Co., Chicago.
J. S. Peanefather, New York.
Universal Elec. Stage Lighting Co., New York. "Kliegl."

LINE MATERIALS.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
Brady Electric Mfg. Co., New Britain, Conn.
Central Electric Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Hubbard & Co., Pittsburgh, Pa.
H. W. Johns-Manville Co., New York, N. Y.
Line Material Co., South Milwaukee, Wis.
Ohio Brass Co., Mansfield, Ohio.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co. East Pittsburgh, Pa.
Lovering Co., C. P., East Cambridge, Mass.
W. N. Matthews & Bro., St. Louis, Mo.
Philadelphia Elec. Mfg. Co., Philadelphia, Pa.

LINES, PULLING (Galvanized)
Universal Cable Grip Co., Syracuse, N. Y. "Universal."

LINKS, Fusible.
See Fuses.

LINKS, Insulating.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Abbott, Linn B., Bridgeport, Conn.

LOCK NUTS.
See Bushings.

LOCKS, Door.
See Openers.

LOCKING GUARDS.
See Guards.

LOCKING SOCKETS.
See Sockets.

LOCKERS, Metal (for employees' clothes).
Allsteelequip Co., Aurora, Ill.
Edward Darby & Sons Co., Philadelphia.
Hess Warming & Ventilating Co., Chicago.

LOCKS, Pole.
Line Material Co., So. Milwaukee, Wis.
Fletcher Mfg. Co., Dayton, Ohio.

LOCOMOTIVES, Electric.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
American Locomotive Co., New York.
Atlas Car & Mfg. Co., Cleveland, Ohio.
Baldwin Locomotive Works, Philadelphia, Pa.
Goodman Mfg. Co., Chicago, Ill
C. W. Hunt Co., West New Brighton, N. Y. (Storage Battery).
Jeffrey Mfg. Co., Columbus, Ohio.
McGuire Cummings Mfg. Co., Chicago, Ill.
Pneumelectric Machine Co., Syracuse, N. Y.

LUBRICANTS.
See also Oils, Lubricating.
Dearborn Chemical Co., Chicago Ill.
Joseph Dixon Crucible Co., Jersey City, N. J. (Graphite.)
International Acheson Graphite Co., Niagara Falls, N. Y. "Oildag."
Keystone Lubricating Co., Philadelphia. (Keystone Grease.)

LUGS, Terminal.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
Chicago Fuse Mfg. Co., Chicago.
Union.
Delta-Star Electric Co., Chicago.
Dossert & Co., New York.
Electrical Engineers Equipment Co., Chicago.
Fargo Mfg. Co., Inc., Poughkeepsie, N. Y.
General Devices & Fittings Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Multi Refillable Fuse Co, Chicago.
Trumbull Electric Mfg. Co., Plainville, Conn.
Universal Electric Stage Lighting Co., New York, N. Y. "Kliegl Bros."
A. G. Elec. & Mfg. Co., Seattle, Wash.
Barkelew Electric Mfg. Co., Middletown, Ohio.
Bliss-Chester Co., Providence, R. I. "Duplex."
Crouse-Hinds Co., Syracuse, N. Y.
Metropolitan Elec. Mfg. Co., Long Island City, N. Y.
Meliorate Mfg. Co., Brooklyn, N. Y.

MACHINES, Armature, Forms, Stands, Trucks, Taping Machines, Commutator Slotting Machines.
See also Formers.
Belden Mfg. Co., Chicago. (Magnet Winders.)
Borden Co., Warren, Ohio.
General Electric Co., Schenectady, N. Y.
Railway & Industrial Engineering Co., Pittsburgh, Pa. (Commutator Slotters.)
American General Trading Co New York. "A. G. E."
American Insulating Machinery Co., Philadelphia, Pa.
Chattanooga Armature Works Chattanooga, Tenn. ("Chatarm" Taping Machine.)
Columbia Machine Works & Malleable Iron Co., Brooklyn, N. Y.
Comstock & Co., Wilkes-Barre Pa. (Winding Forms.)
J. P. Devine Co., Buffalo, N. Y. (Impregnating Apparatus.)
Device Improvement Co., Hanover, Pa. ("Peerless" Commutator Slotting Machines.)
Exeter Machine Works, Pittston, Pa. (Winding Forms.)
G. M. Griswold Machine Co., New Haven, Conn. (Taping Machines.)
Frank Ridlon Co., Boston, Mass. "Singer."

MACHINES, Pipe Threading and Cutting (Motor Driven.)
Borden Co., Warren, Ohio. "Beaver."
Armstrong Mfg. Co., Bridgeport, Conn.
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
Cox & Sons Co., Bridgeton, N. J
Crane Co., Chicago, Ill.
The Curtis & Curtis Co., Bridgeport, Conn. "Forbes."
Hoefer Mfg. Co., Freeport, Ill.
Jarecki Mfg. Co., Erie, Pa.
Merrell Mfg. Co., Toledo, Ohio.
Murchey Machine & Tool Co., Detroit, Mich.
D. Saunders' Sons, Yonkers, N. Y.
Standard Engineering Co., Ellwood City, Pa. "Wieland."
Stoever Foundry & Mfg. Co., Myerstown, Pa.
Williams Tool Co., Erie, Pa.

MACHINES, Steel Box Making.
H. Weiss & Co., New York.
Taunton-New Bedford Copper Co., Taunton, Mass.
Worcester Electric & Mfg. Co., Worcester, Mass.

MACHINES, Wire Covering.
See Insulating Machinery.

MACHINE TOOLS, Motor Driven.
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Mechanical Appliance Co., Milwaukee, Wis.

MAGNETIC SWITCH CONTROLLERS (for large motors.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Industrial Controller Co., Milwaukee, Wis.
Sundh Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MAGNETOS, MAGNETO-GENERATORS AND BELLS.
Manhattan Electrical Supply Co., New York.
Schwarze Electric Co., Adrian, Mich.
Western Electric Co., New York.

American Electric Co., Chicago.
A. Andrae & Sons Co., Milwaukee, Wis.
Century Tel. Const. Co., Buffalo, N. Y.
Connecticut Telephone & Electric Co., Meriden, Conn.
Dean Electric Co., Elyria, Ohio
De Veau Telephone Mfg. Co., Brooklyn, N. Y.
Holtzer-Cabot Electric Co., Brookline, Mass.
Kellogg Switchboard & Supply Co., Chicago, Ill.
Menominee Elec. Mfg. Co., Menominee Mich.
Monarch Tel. Mfg. Co., Chicago.
Standard Tel. Mfg. Co., Portsmouth, Ohio.
Sumter Telephone Mfg. Co., Sumter, S. C. "Mason."
Utica Fire Alarm Teleg. Co., Utica, N. Y.
Western Telephone Mfg. Co., Chicago, Ill.

MAGNET WINDERS.
See Winders. Magnet.

MAGNETO BELLS.
See Generators.

MAGNETOS, Ignition.
General Electric Co., Schenectady.
Industrial Controller Co., Milwaukee, Wis.
Manhattan Electrical Supply Co., New York.
American Coil Co., Foxboro, Mass. "Little Wonder."
Apple Electric Co., Dayton, Ohio. "Apico."
Bosch Magneto Co., New York.
J. S. Brots Mfg. Co., New York, "U. & H."
Carlisle & Finch Co., Cincinnati, Ohio.
Albert Champion Co., Boston, Mass. "Gianoli."
Connecticut Telephone & Electric Co., Meriden, Conn.
D. K. Electric Co., St. Louis, Mo. "Duncan."
Dayton Electrical Mfg. Co., Dayton, Ohio. "Apple."
Dow Mfg. Co., Braintree, Mass. "Komet."
Eisemann Magneto Co., New York.
Elbridge Electrical Mfg. Co., Elbridge, N. Y.
Goodson Electric Ignition Co., Providence, R. I.
Heinze Elec. Co., Lowell, Mass.
Henricks Novelty Co., Indianapolis, Ind. "Eureka."
Hercules Electric Co., Indianapolis, Ind. "Wizard."
Holtzer-Cabot Electric Co., Brookline, Mass.
Igniter Appliance Co., Cleveland, Ohio.
K. W. Ignition Co., Cleveland, Ohio.
Kendrick & Davis Co., Lebanon, N. H.
Kent Mfg. Co., Atwater, Philadelphia, Pa.
Knoblock-Heideman Mfg. Co., South Bend, Ind.
Lutz-Lockwood Mfg. Co., Roselle, N. J. "SX."
Marine Launch Igniting Co., Watkins, N. Y. "A. B. C."
Mayity-Sleeper Co., Fowler, Ind.
Motsinger Device Mfg. Co., Lafayette, Ind. "Auto-Sparker."
Perfection Magneto Co., Anderson, Ind.
Pittsfield Spark Coil Co., Pittsfield, Mass.
Remy Electric Co., Anderson, Ind.
Reppell Electric Co., Kansas City, Mo.
Schug Electric Mfg. Co., Detroit.
C. F. Splitdorf, New York.
Standard Motor Construction Co., Jersey City, N. J.
Stecker Elec. & Machine Co., Detroit, Mich.
Swiss Magneto Co., Chicago, Ill. (Importers "Swiss-Kamet.")
Tritt Electric Co., Union City, Ind. "Vim," "Peerless."
Vesta Accumulator Co., Chicago.
Webster Mfg. Co., Chicago, Ill. "Milton."
Wheichel Electric Co., Anderson, Ind.
Witherbee Igniter Co., Springfield, Mass. "Volta."

MAGNETS, Electro.
Acme Wire Co., New Haven, Conn.
Belden Mfg. Co., Chicago, Ill.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, Ohio.
General Electric Co., Schenectady.
Industrial Controller Co., Milwaukee, Wis.
Manhattan Electrical Supply Co., New York.
Sundh Electric Co., New York.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Automatic Electric Co., Chicago.
J. H. Bunnell & Co., New York.
Knoblock-Heideman Mfg. Co., South Bend, Ind.
Partrick, Carter & Wilkins Co., Philadelphia, Pa.
Queen-Gray Co., Philadelphia, Pa.
C. F. Splitdorf, New York.
Thordarsen Electric Mfg. Co., Chicago, Ill.

MAGNETS, Lifting.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, Ohio.
Industrial Controller Co., Milwaukee, Wis.
Lincoln Electric Co., Cleveland, Ohio.
Sundh Electric Co., New York.
Western Electric Co., New York.
Browning Engineering Co., Cleveland, Ohio.
Pawling & Harnischfeger Co., Milwaukee, Wis.

MAGNETS, Permanent.
Esterline Co., The, Indianapolis, Ind.
Western Electric Co., New York.
Automatic Electric Co., Chicago.
Boker & Co., Hermann, New York, N. Y. (Importers.)
Edward E. Cary Co., New York. Importers.)
Queen-Gray Co., Philadelphia, Pa.
Utica Fire Alarm Teleg. Co., Utica, N. Y.

MANGANESE.
See Chemicals.

MARBLE, Switchboard.
De Paoli Mosaic Association, Boston, Mass.
Evans Marble Co., Baltimore, Md.
A. Klaber & Son, Long Island City, N. Y.
McNamara Bros., Fair Haven, Vt.
Wm. H. Pelkey, Fair Haven, Vt.
Rutland Marble Mfg. Co., Rutland, Vt.
Vermont Marble Co., Proctor, Vt.

MARINE FIXTURES.
Benjamin Electric Mfg. Co., Chicago, Ill. (Outlet Box.)
Delta-Star Electric Co., Chicago.
Electric Appliance Co., Chicago, Ill. (Waterproof Receptacles.)
General Electric Co., Schenectady.
Western Electric Co., New York.
American Electrical Supply Co., Chicago, Ill. (Sole Selling Agents "Newgard" Waterproof Receptacle.)
Barre & Co., Joseph, New York.
James F. Burns, Philadelphia, Pa. ("V. V" Waterproof Snap Switch Attachments and Globe Caps.)
Crouse-Hinds Co., Syracuse, N. Y. ("Condulet" Waterproof Receptacle.)
C. D. Durkee & Co., New York.
Lovell & Co., F. H., Arlington, N. J.
Lovell-McConnell Mfg. Co., Newark, N. J.
Porter Co., New York.
Edro Richardson Brass Co., Baltimore, Md.
Russell & Stoll Co., New York.
Seidler-Miner Electric Co., Detroit, Mich. "Conditype."
Universal Standard Electric Co., Brooklyn, N. Y.
Yonkers Electric Mfg. Co., Yonkers, N. Y. (Watertight Switch Box.)

MARINE SIGNALS.
See Signals.

MASSAGE VIBRATORS.
See Vibrators.

MAST ARMS.
Brady Electric Mfg. Co., New Britain, Conn.
Geo. Cutter Co., South Bend, Ind.
Fort Wayne Electric Works, Fort Wayne, Ind.
Line Material Co., So. Milwaukee, Wis.
Philadelphia Electrical Mfg. Co., Philadelphia, Pa.
Buffalo Specialty Co., Buffalo.
Electric Railway Equipment Co., Cincinnati, Ohio.
Fletcher Mfg. Co., Dayton, Ohio.
Lundin Elec. & Mach. Co., Boston, Mass. "Philbrick."
Pittsburgh Transformer Co., Pittsburgh, Pa.
C. W. Walls & Co., Worcester, Mass.

MATTING, Burglar Alarm.
Partrick, Carter & Wilkins Co., Philadelphia, Pa.

MATTING, INSULATING.
New York Belting & Packing Co., New York.
Walpole Tire & Rubber Co., Walpole, Mass.

MEASURING MACHINES (For Wire Measuring.)
Minneapolis Electric & Construction Co., Minneapolis, Minn.
New England Butt Co., Providence, R. I.
Frank Mossberg Co., Attleboro, Mass.
J. J. Waldman, New York.

MEAT CHOPPERS, Electric.
Brecht Co., St. Louis, Mo.
Cincinnati Butchers' Supply Co., Cincinnati, Ohio. "Boss."
Cleveland Meat Chopper Co., Cleveland, Ohio.
Computing Scale Co., Dayton, Ohio. "Dayton" Electric Meat Slicer.
Computing Scale & Fixture Co., Cincinnati, Ohio.
A. J. Deer Co., Inc., Hornell, N. Y. "Royal."
Enterprise Mfg. Co., Philadelphia, Pa.
Hobart Electric Mfg. Co., Troy, Ohio.
B. C. Holwick, Canton, Ohio.
John E. Smith's Sons Co., Buffalo, N. Y. "Buffalo Silent."
Steiner Mfg. Co., St. Louis, Mo.
Stimpson Mercantile Equipment Co., Northville, Mich. "Peerless."
U. S. Slicing Machine Co., Chicago, Ill.

MEDICAL APPARATUS, Surgical, Dental, Therapeutical, Static Machines.
Campbell Electric Co., Lynn, Mass.
Lindstrom-Smith Co., Chicago, Ill. ("White Cross" Vibrator and Medical Transformer for Incandescent Circuits.)
Metropolitan Engineering Co., New York City.
Shelton Electric Co., New York, N. Y.
Western Electric Co., New York.
W. D. Allison Co., Indianapolis, Ind. (Physicians' & Surgeons' Supplies.)
Anderson, Norden & Co., Chicago, Ill. ("Nelson" Static Machine.)
Baker Electric Co., Hartford, Conn. (Static Machines.)
Birtman Electric Co., Chicago, Ill. ("Colonial" Static Machine.)
F. W. Braun, Los Angeles, Cal. (Centrifuge.)
Coates Clipper Mfg. Co., Worcester, Mass. (Motor and Flexible Cable Outfits for Dental Purposes.)
Electro-Dental Mfg. Co., Philadelphia, Pa. (Dental Appliances.)
Electro Importing Co., New York. (Static Machines.)
Electro Surgical Instrument Co., Rochester, N. Y.
H. P. Engeln & Co., Cleveland, Ohio.
A. W. Fenner Co., Providence, R. I. (Physicians' and Surgeons' Instruments.)
Good Health Publishing Co., Battle Creek, Mich. (Bath Cabinet.)
Howard Co., Canton, Ohio. ("Gerhard" Dental Appliances.)
J. W. Hughes Co., New York. (Physicians' & Surgeons' Supplies.)
Hutchison Acoustic Co., New York. (Acousticons for the deaf.)
International Instrument Co., Cambridge, Mass. (Centrifuge.)
Kendrick & Davis Co., Lebanon, N. H. (Household Medical Coils.)
Keystone Electric Co., Philadelphia, Pa.
L. E. Knott Apparatus Co., Boston, Mass. (Static Machines.)
Kny-Scheerer Co., New York.
Leucodescent Co., Chicago, Ill., "Clark's" Leucodescent Lamp.
D. F. McElliot, Chicago, Ill. (Static Machines.)
McIntosh Battery & Optical Co., Chicago, Ill. (Physicians' & Surgeons' Supplies.)
Macalaster Wiggin Co., Boston, Mass. (Switch for Automatically Timing Electric Currents.)
Wm. Meyer Co., Chicago, Ill.
Midgley's Radiodescent Lamp Co., Kalamazoo, Mich. ("20th Century" Ultra Violet Ray Lamp.)
Noel Armstrong Co., Akron, O (Physicians' & Surgeons' Supplies.)
Pelton & Crane Co., Detroit, Mich. (Sterilizers. Gold Annealers, Cautery Outfits and Dentists' Lamps.)
Queen-Gray Co., Philadelphia Pa.
Ritter Dental Mfg. Co., Rochester, N. Y. ("Columbia" Dental Appliances.)
Sanax Co., Inc., New York.
Scheidel-Western X-Ray Coil Co., Chicago, Ill. (Static Machines.)
Shedd Electric Co., Roselle Park, N. J. (Centrifuge.)
Shelton Electric Co., New York. (Therapeutic Vibrators, Centrifuges.)
Todd Electric Mfg. Co., Meriden, Conn. (Static Machines.)
Van Houten & TenBroeck Co., New York (Physicians' & Surgeons' Supplies.)
Victor Electric Co., Chicago, Ill.
Wappler Electric Mfg. Co., Inc., New York.
Varwig Mfg. Co., Cincinnati, Ohio. (Physicians' Air Pump.)
Waite & Bartlett Mfg. Co., New York. (Physicians' & Surgeons' Supplies.)
S. S. White Dental Mfg. Co., Philadelphia, Pa. (Dental Appliances.)

MESSENGER HANGERS.
Frank B. Cook, Chicago, Ill.
Hallett Iron Works, Harvey, Ill.

METAL, Electrical Sheets—Iron and Steel.
American Sheet & Tin Plate Co., Pittsburgh. (Pole-face Sheets, Armature Sheets), Roofing and Siding Sheets, Roofing Tin, Special Sheets, Black Sheets, Galvanized Sheets, Tin and Terne Plates.
American Rolling Mill Co., Middletown, Ohio.
Follansbee Bros. & Co., Follansbee, W. Va.

METAL SPINNINGS. See Spinnings.

METAL FINISH, for Refinishing Fixtures.
Gun Metal Finish Co., Decatur, Ill.

METAL SHEARS
Chicago Patented Tools Co., Chicago.

METER COVERS, Glass.
Haskins Glass Co., Wheeling, W. Va.

METER PROTECTIVE DEVICES.
Metropolitan Engineering Co., New York City.

METERS, Recording.
Bristol Co., Bridgeport, Conn.
Esterline Co., The, Indianapolis, Ind.
General Electric Co., Schenectady, N. Y.
Sangamo Electric Co., Springfield, Ill.
Schweitzer & Conrad, Inc., Chicago.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Electric Fuseguard Co., Newark, N. J.

METERS, Gas, Electrically operated.
Cutler-Hammer Mfg. Co., Milwaukee, Wis. "Thomas".
Mohawk Electric Mfg. Co., Newark, N. J.

METERS, Integrating. See Wattmeters.

METERS, REGISTERS AND TOLL BOXES, Telephones.
American Electric Co., Chicago, Ill. "National".
Baird Electric Co., Chicago, Ill.
Gray Telephone Pay Station Co., Hartford, Conn.
Telechronometer Co., Rochester, N. Y.
Turner Brass Works, Sycamore, Ill. "Telometer".

MICA.
Chicago Mica Co., Valparaiso, Ind. "Micabond".
Johns-Manville Co., H. W., New York.
Mica Insulator Co., New York.
Mitchell-Rand Mfg. Co., New York.
Eugene Munsell & Co., New York.
Star Mica Mining Co., Inc., Canaan, N. Y.
American Mica Co., Newton, Lower Falls, Mass. "Micabeston".
Asheville Mica Co., Asheville, N. C.
J. E. Burleson Mica Co., Spruce Pine, N. C.
Formica Insulation Co., Cincinnati, Ohio.
Keene Mica Products Co., Keene, N. H.
Meirowsky Bros., New York. "Excelsior", "Royal Megohmite".
Mica Mfg. Co., New York, N. Y.
Monarch Standard Mica Mining Co., New York.
Pias-Mica Co., Yonkers, N. Y.
Republic Mica Co., New York, N. Y.
Robert K. Preston Co., Chicago.
A. O. Schoonmaker Co., New York.
Tar Heel Mica Co., Plumtree, N. C.
U. S. Mica Co., Chicago, Ill.
Watson Bros., Boston, Mass.

MILKING MACHINES.
See Dairy Apparatus.

MILLS, COFFEE (Electrically Driven).
Coles Mfg. Co., Philadelphia, Pa
Computing Scales & Fixture Co., Cincinnati, Ohio
A. J. Deer Co., Inc., Hornell, N. Y. "Royal".
Enterprise Mfg. Co., Philadelphia, Pa.
Hobart Electric Mfg. Co., Troy, Ohio.
S. C. Holwick, Canton, Ohio.
Howe Scale Co., Rutland, Vt.
Stimpson Mercantile Equipment Co., Northville, Mich. "Peerless".

MINERAL WOOL.
Columbia Mineral Wool Co., South Milwaukee, Wis.
United States Mineral Wool Co., New York.

MINIATURE LAMPS. See Lamps, Incandescent, Miniature.

MINING MACHINERY (Motor Driven).
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Chicago.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
American Rotary Tunnel Machine & Development Co., Denver, Colo. ("Stanboos" Tunneling Machine.)
Christmas Electric Co., Wilkinsburg, Pa. (Coal.)
Economy Machinery Co., Denver, Colo. ("Diets" Air-electric Rock Drills.)
Goodman Mfg. Co., Chicago, Ill.
Ingersoll-Rand Co., New York. ("Electric Air" Channeling Machines for Quarries.)
Jeffrey Mfg. Co., Columbus, Ohio.
Morgan-Gardner Electric Co., Chicago, Ill.
Pneumelectric Machine Co., Syracuse, N. Y. (Coal Punchers.)
Sullivan Machinery Co., Chicago, Ill.

MIRRORS, Shaving.
Federal Sign System, (Electric), Chicago.
Franks Mfg. Co., Rock Island, Ill.

MITERS, For Cutting Moulding.
Smith & Hemenway Co., New York.
J. M. Seymour, Jr., Newark, N. J.

MIXERS, Drink.
Hamilton-Beach Mfg. Co., Racine, Wis. "Cyclone".
Lindstrom-Smith Co., Chicago.
Fulton-Bell Co., New York. "U-See-Us", "Cyclone".
Shelton Elec. Co., Chicago.

MOLDED INSULATION.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
General Bakelite Co., New York, N. Y.
Hemming Mfg. Co., Garfield, N. J.
Scranton Button Co., Scranton, Pa.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

MOTORS, Automobile.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland, Ohio.
Thos. B. Jeffery Co., Kenosha, Wis.
Wagner Electric Mfg. Co., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MOTORS AND DYNAMOS
Advance Electric Co., St. Louis, Mo. (Small A. C. Motors.)
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Central Electric Co., Chicago, Ill.
Century Electric Co., St. Louis, Mo.
Jas. Clark, Jr., Elec. Co., Louisville, Ky. "Willey".
Colonial Fan & Motor Co., Warren, Ohio.
Crocker-Wheeler Co., Ampere, N. J.
Diehl Mfg. Co., Elizabethport, N. J.
Eck Dynamo & Motor Co., Belleville, N. J.
Electric Machinery Co., Minneapolis, Minn.
Emerson Electric Mfg. Co., St. Louis, Mo.
Fairbanks, Morse & Co., Chicago.
Fort Wayne Electric Works, Ft. Wayne, Ind. "Northern", "Wood".
General Electric Co., Schenectady.
Hamilton-Beach Mfg. Co., Racine, Wis.
Kentucky Electrical Co., Inc., Owensboro, Ky.
Kimble Electric Co., Chicago, Ill.
Lincoln Electric Co., Cleveland, Ohio.
Fan Electric Mfg. Co., St. Louis, Mo. "Chandeysson."
Reynolds Electric Co., Chicago, Ill.
Ridgway Dynamo & Engine Co., Ridgway, Pa. "Thompson-Ryan".
Robbins & Myers Co., Springfield, Ohio. "Standard".
Roth Bros. & Co., Chicago, Ill.
Sprague Electric Works, New York. "Lundell".
Triumph Electric Co., Cincinnati.
Wagner Electric Mfg. Co., St. Louis, Mo.
Western Electric Co., New York. "Hawthorn".
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wisconsin Electric Co., Racine, Wis.
American Engine Co., Round Brook, N. J.
American Rotary Valve Co., Anderson, Ind. "Jenney."
Archer & Baldwin, New York.
Barnes Mfg. Co., Susquehanna, Pa.
Barnes Mfg. Co., Susquehanna, Pa. (Small Motors.)
D. L. Bates & Bro. Co., Dayton, Ohio ("Imperial.")
Bell Electric Motor Co., New York, N. Y.
Birtman Electric Co., Chicago, Ill. ("Bee" Small Motors.)
Bissell Motor Co., Toledo, Ohio (Sewing Machine Motors.)
Bodine Electric Co., Chicago, Ill. (Dental Motors and Grinders.)
C. J. Bogue Electric Co., New York.
Burke Electric Co., Erie, Pa.
C. & C. Electric & Mfg. Co., Garwood, N. J.
The Carleton Co., Boston, Mass
Cleveland Armature Works, Cleveland, Ohio.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Cushman Electric Co., Concord, N. H.
A. J. Deer Co., Inc., Hornell, N. Y.
Dienelt & Eisenhardt, Philadelphia, Pa.
Dover Electric Mfg. Co., Canal Dover, Ohio.
Eager Electric Co., Watertown, N. Y.
Elbridge Elecl. Mfg. Co., Elbridge, N. Y.
Electric Specialty Co., Stamford, Conn.
Electro-Dynamic Co., Bayonne, N. J.
Engberg's Electric & Mechanical Works, St. Joseph, Mich.
Federal Electric Co., North Girard, Pa.
Fidelity Electric Co., Lancaster, Pa. ("Eclipse" Motors.)
Fisher Electrical Works, Detroit, Mich.
Fosberg Motor Works, New York.
Fuller Co., Detroit, Mich.
G. & E. Electric & Construction Co., Binghamton, N. Y.
Green Electric Co., W., New York.
Hertner Elec. & Mfg. Co., Cleveland, Ohio.
Holtzer-Cabot Electric Co., Brookline, Mass.
Holt Elec. Co., Milwaukee, Wis.
Horn Electric Co., Chicago, Ill. (Motors.)
Ideal Electric & Mfg. Co., Mansfield, Ohio.
Imperial Electric Co., Akron, Ohio.
Jantz & Leist Elec. Co., Cincinnati, Ohio.
James Jones Co., Los Angeles, Cal. (Small.)
Kelley Electric Machine Co., Buffalo, N. Y.
Kester Electric Co., Terre Haute, Ind.
Klein, Nathan, & Co., Inc., New York City.
Kurz & Root, Appleton, Wis.
Lamb Elec. Co., Grand Rapids, Mich.
Lanigan & Rosemont Elec. Co., New York. (Small Motors.)
McCarthy Bros. & Ford, Buffalo.
Marelli & Co., Ltd., Ercole, New York City.
Mechanical Appliance Co., Milwaukee, Wis. "B. T.", "Watson".
Menominee Electric Mfg. Co., Menominee, Mich.
Morgan-Gardner Electric Co., Chicago, Ill.
Northwestern Mfg. Co., Milwaukee, Wis.
Olson-Boettger Elec. Mfg. Co., St. Paul, Minn. (Small.)
Phoenix Elec. Co., Mansfield, Ohio.
Power Electric Co., Canton, Ohio.
Reliance Elec. & Engng. Co., Cleveland, Ohio.
Peerless Electric Co., Warren, Ohio.
Richmond Electric Works, Richmond, Va.
Rochester Electric Motor Co., Rochester, N. Y. "Service".
Rosenmaseler-Bonine Elec. Co., Philadelphia, Pa.
Shedd Electric Co., Roselle Park, N. J.
Star Dynamo Co., Jefferson City, Mo.
Stow Mfg. Co., Binghamton, N. Y. (Polishers and Buffers.)
Sturtevant Co., Hyde Park, Mass.
Swing Elec. Co., Cincinnati, Ohio. "Barriett".
Troy Electrical Co., Troy, N. Y.
U. S. Electrical Mfg. Co., Los Angeles, Cal. "Usemco".
Victor Electric Co., Chicago, Ill. (Small.)
Virginia Electric & Machine Works, Charleston-Kanawha, W. Va.
Joseph Weidenhoff, Chicago, Ill. (Small Motors.)

MOTORS, BATTERY, Battery Motors, Battery Fans, Toy Motors
Manhattan Electrical Supply Co., New York.
Rittenhouse Co., A. E., Honeoye Falls, N. Y.
Carlisle & Finch Co., Cincinnati.
The Carleton Co., Boston, Mass.
Elbridge Elecl. Mfg. Co., Elbridge, N. Y.
Industrial Novelty Co., Chicago.
Ithaca Electric Novelty Co., Ithaca, N. Y. "Rienco".
Kenrick & Davis Co., Lebanon, N. H.
Knapp Electric & Novelty Co., New York. "Kenco", "Little Hustler".
Lionel Mfg. Co., New York. "New Departure".
Menominee Elec. Mfg. Co., Menominee, Mich.
Henry R. Swope, Philadelphia, Pa. "Keystone", "H. R. S."
Trembly Elec. Co., Centerville, Iowa.
Voltamp Electric Mfg. Co., Baltimore, Md.

MOULDING FITTINGS.
Appleton Electric Co., Chicago.
Jordan Bros., New York. (Splice Protectors Only.)
National Metal Molding Co., Pittsburgh, Pa.
H. T. Paiste Co., Philadelphia, Pa. "P. K. Taplets".
Stanley & Patterson, New York.
Trumbull Electric Mfg. Co., Plainville, Conn. ("H. & M." Branch Blocks.)
Fancleve Specialty Co., Jamaica Plain, Boston, Mass.
Gillette-Vibber Co., New London, Conn.

MOULDING, Metallic.
Appleton Electric Co., Chicago.
American Circular Loom Co., New York City. ("Lutz.")
National Metal Molding Co., Pittsburgh, Pa.

MOULDINGS, Wood.
American Hardware Mfg. Co., Grottoes, Va.
Central Mfg. Co., Chattanooga, Tenn.
Foley Mfg. Co., Chicago, Ill.
Kirkpatrick Mfg. Co., Philadelphia, Pa. "Hold Wire", "Simplex".
Mitchell Moulding Co., Chicago, Ill. "Wire Grip"
Novelty Turning Co., Norway, Maine.
Plannett Lumber & Mfg. Co., La Porte Ind.
J. M. Saulpaugh's Sons, New York.
Henry H. Sheip Mfg. Co., Philadelphia, Pa.
Thornton & Co., Holland, Mich.
Wright & Craycroft, Chicago.

MOUTHPIECES, Glass.
American Electric Co., Chicago. "Germproof".
Gibson Mfg. Co., Danbury, Conn.
Maxim Specialty Co., New York.
J. S. Schneider Co., Ridgefield, Conn.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.

NETS AND GUARDS, Arc Lamp.
Western Electric Co., New York.
Hamblin & Russell Mfg. Co., Worcester, Mass. "Never Break".
Morse, Frank W., Boston, Mass.

NEUTRALIZERS, Static Charge. (For Printers and Textile Manufacturers.)
Chapman Electric Neutralizer Co., Portland, Me.

NIPPLES. See Couplings.

NOVELTIES. See Toys, also Motors, Battery.

NUMBERS, Automobile License, Electric Illuminated.
Atlas Stamping Co., Chicago, Ill.
Holt & Beebee Co., Boston.
Peerless Head & Tail Light Co., Chicago, Ill.

NUT LOCKS. See Bushings.

OFFICE ACCESSORIES. (Motor Driven.)
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. (Eraser for Draughtsmen.)
American Cash Register Co., Columbus, Ohio.
American Graphophone Co., Bridgeport, Conn
American Multigraph Co., Cleveland, Ohio.
Automatic Coinwrapping Machine Co., New York.
Blickensderfer Mfg. Co., Stamford, Conn. (Typewriters.)
Bowes Envelope Sealer Co Pittsburgh, Pa.
Burroughs Adding Machine Co Detroit, Mich. (Adding Machines.)
Coates Clipper Mfg. Co., Worcester, Mass. (Erasers.)
Comptograph Co., Chicago, Ill. (Adding and Listing Machines.)
A. & B. Dick Co., Chicago, Ill. (Letter and Circular Folders.)
Elliott Addressing Machine Co Cambridge, Mass.
Flexotype Co., Burlington, N. J.
Gray Nat'l Telautograph Co. New York. (Telautographs.)
Mailometer Co., Chicago, Ill. (Letter Sealers, Counters and Stampers.)
Montague Mailing Machinery Co Chattanooga, Tenn (Addressing Machines.)
Meacham Addressing Machine Co., New York.
National Cash Register Co., Dayton, Ohio. (Cash Registers.)
National Dictograph Co., Jamaica, N. Y. (Dictograph.)
National Folding Machine Co. Sidney, Ohio. (Letter and Circular Folders.)
Neostyle Co., New York. (Duplicating Apparatus.)
Pike Adding Machine Co., Orange, N. J.
Rapid Addressing Machine Co New York. (Addressing Machines.)
Roneo Co. New York (Copying Machine.)
W. Sparks, New York. (Desk Punches.)
Stromberg Electric Co., Chicago Ill. "Chronograph".
Tabulating Machine Co., Washington, D. C.
U. S. Printograph Co., La Crosse Wis.
Universal Adding Machine Co. St. Louis, Mo. (Adding Machines.)
Velox Co., New York. (Addressing Machines.)
Victor Talking Machine Co Camden, N. J. "Auxetphone"
Yawman & Erbe Mfg. Co., Rochester, N. Y. (Labeling Machines and Letter Copiers.)

OHMMETERS. See Instruments Testing.

OIL ENGINES. See Engines.

OIL FILTERS. See Filters, Oil

OIL FLOW INDICATORS AND METERS.
Chemelectric Co., Chicago.

OIL FUSE BOXES. See Boxes Oil.

OPENERS AND LOCKS, Door
See Door Openers and Locks.

ORGAN BLOWERS. See Blowers, Organ.

OSCILLATORS, Fan. See Deflectors.

OUTFITS, Automobile Lighting
See Automobile Lighting Outfits.

OUTLET BOXES. See Boxes Conduit.

OUTRIGGERS, Arc Lamp. See Brackets.

OVENS. See Cooking Devices.

OZONATORS AND AIR PURIFIERS.
Federal Sign System, (Electric), Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Sprague Electric Works, New York City.
Julius Andrae & Sons Co., Milwaukee, Wis. (Submerged Lamps, Hygro-Electric Moistener.)
Carrier Air Conditioning Co., New York, N. Y.
S. W. Cramer Co., Charlotte, N. C. (Air Purifying Apparatus.)
Duntley Mfg. Co., Chicago, Ill (Air Purifier.)
Fries, J. W., Winston-Salem, N. C. "Hygrosse," "Clean-Air."
Kauffman Heating & Mfg. Co., St. Louis. "Kinealy."
Ozone Pure Airifier Co., Chicago, Ill. (Ozone Apparatus.)
Ozonizer Co., Chicago, Ill.
Standard Electro Utilities Co., Chicago, Ill. "Vohr".
Thomas & Smith, Chicago, Ill (Air Purifying Apparatus.)

Warren Webster & Co., Camden N. J.

PACKING, STEAM.
B. F. Goodrich Co., Akron, Ohio. "Superheat".
H. W. Johns-Manville Co., New York.
New York Insulated Wire Co., New York. "Lightning Non-Tubular".
American Goetze Gasket & Packing Co., New Brunswick, N. J.
A. W. Chesterton Co., Boston, Mass. "Metalbestos."
Clifton Mfg. Co., Jamaica Plain, Mass.
Eureka Packing Co., New York.
Garlock Packing Co., New York.
Jenkins Bros., New York.
McCord Mfg. Co., Detroit, Mich.
Peerless Rubber Mfg. Co., New York. "Success", "Germane", "Honest John", "Hercules", "Uniphite", "Rainbow", "Arctic", "Zero".
Quaker City Rubber Co., Philadelphia. "PPP" Packing.
J. L. Robertson & Sons, New York. "Eureka."
Steel Mill Packing Co., Detroit, Mich. "Safety" Metallic Packing.
U. S. Mineral Wool Co., New York.

PAINTS AND COMPOUNDS, Insulating. See Insulating Paints.

PAINTS, Preservative.
Carbolineum Wood Preserving Co., Milwaukee, Wis.
Joseph Dixon Crucible Co., Jersey City, N. J. "Griphite".
H. W. Johns-Manville Co., New York.
Standard Paint Co., New York. "Flexite," "P. B.," "P. & B.," "Giant."
Western Electric Co., Chicago.
L. S. Brach Supply Co., New York.
C-A Wood Preserver Co., St. Louis, Mo.
Flintkote Mfg. Co., New York, N. Y. "Rex No. 1, No. 2 and No. 1 Red."
German Importing Co., Chicago, "Hy-Boil-Oil."
Standard Varnish Works, New York. "W. P."
Sterling Varnish Co., Pittsburgh.
Walpole Tire & Rubber Co., Walpole, Mass. "M. C."
Wyckoff Pipe & Creosoting Co., Portsmouth, Va.

PANEL BOARDS. See Switchboards.

PAPER, Insulating Papey, Fuller Board, Press Board.
Chicago Mica Co., Valparaiso, Ind.
Diamond State Fibre Co., Bridgeport, Pa.
American Mica Co., Newton, Lower Falls, Mass. "Puritan."
Carter, Rice & Co., Boston, Mass.
Case Bros., Highland Park, Conn. (Fuller Board.)
Case-Risley Press Paper Co., Oneco, Conn. (Fuller Board.)
Merwin Paper Co., Hartford, Conn. **(Fuller Board.)**
Pittsburgh Insulating Co., Pittsburgh, Pa.
E. R. Ramsey Co., Penn Yan, N. Y.
Rogers Paper Mfg. Co., South Manchester, Conn. (Fuller Board.)
Walpole Tire & Rubber Co., Walpole, Mass. "Neponset".

PAPER SLEEVES. See Sleeves.

PARAFFINE. See Wax.

PATENT SOLICITORS.
Duvall, E. S., Washington, D. C.
Grossman, L. G., Washington, D. C.
Thomas Howe, New York, N. Y.
Siggers, E. G., Washington, D. C.

PEARL.
Erie Button Works, Erie, Pa.
Independent Button & Machine Co., Chicago.

PEELERS, Vegetable. (Motor Driven.)
Imperial Machine Co., New York. "Victoria".

PENDANTS, Wiring.
Cutter Co., Geo., South Bend, Ind.
Fletcher Mfg. Co., Dayton, Ohio. "Etheridge".

PERMANENT MAGNETS. See Magnets.

PHOTOMETERS, Lamp Testing.
Leeds & Northrup Co., Philadelphia, Pa.
Thompson-Levering Co., Philadelphia, Pa. "Peerless".
James G. Biddle, Philadelphia, Pa. (Importer "Siemens & Halske".)
Foote, Pierson & Co., New York. "Matthews". "Sharp-Millar"
W. & L. E. Gurley, Troy, N. Y.
Precision Instrument Co., Detroit, Mich.
Queen-Gray Co., Philadelphia, Pa.

PHOTOMETER STANDARDS.
Electrical Testing Laboratories, New York, N. Y.

PIANO PLAYERS, Electric.
Choraico Mfg. Co., Boston, Mass.
F. Engelhardt & Sons, St. Johnsville, N. Y.
Foster-Armstrong Co., Rochester, N. Y.
Telelectric Co., Pittsfield, Mass.

PIGTAILS AND FLEXIBLE LEADS.
Belden Mfg. Co., Chicago, Ill.
Chas. E. Chapin Co., Inc., New York, N. Y.
Rome Wire Co., Rome, N. Y.
James Goldmark Co., New York. (Sole Selling Agent for New England Electrical Works, Lisbon, N. H.)

PILOT HOUSES. See Houses.

PINIONS. See Gears.

PINS AND BRACKETS, Wood.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
F. Bissell Co., Toledo, Ohio.
Central Telephone & Electric Co., St. Louis, Mo. "Bois De Arc."
Electrical Engineers Equipment Co., Chicago, Ill. (Pipe Clamp Pins.)
General Devices & Fittings Co., Chicago, Ill.
Ohio Brass Co., Mansfield, Ohio.
Western Electric Co., New York.
W. M. Absher Co., North Wilkesboro, N. C.
American Cross-Arm Co., Chicago.
Clarence Call, North Wilkesboro, N. C.
W. R. Carmichael, Ravenswood, W. Va.
Central Mfg. Co., Chattanooga.
Cohn & Bock Co., Princess Anne, Md.
Cottage Planing Mill Co., Everett, Pa.
Elkin Machinery Co., Elkin, N. C.
B. F. & R. P. Gravely, Martinsville, Va.
Houston & Liggett, Houston, Texas.
Kapp & Miller Co., Rural Hall, N. C.
Kettle River Co., Minneapolis.
Locust Pin Co., Front Royal, Va.
H. Marcus, Muscoda, Wis.
Mineralac Electric Co., Chicago. "Unity" Insulator and Pin.
National Electrical Supply Co., Washington, D. C.
Osborne & Son, Camden, N. Y.
Oskosh Mfg. Co., Oshkosh, Wis. (Kalkeen.)
Victor Petertyl, Traverse City, Mich.
Pettingell-Andrews Co., Boston, Mass. (O'Neill Reinforced.)
Philadelphia Electric Mfg. Co., Philadelphia, Pa.
Pilliod Lumber Co., Swanton, Ohio.
Russell & Stoll Co., New York. (Marine.)
Standard Pin & Bracket Co., Madison, Ind.
B. F. Stevens Stave Co., Martinsville, Ind.
Texas Arm & Pin Co., Beaumont, Texas.
Towers Pin & Bracket Co., Ellijay, Ga.
Trammell Co., Louisville, Ky.
U. S. Bobbin & Shuttle Co., Providence, R. I.
A. S. Wade & Co., Shippensburg, Pa.

PINS, INSULATOR, IRON. See Brackets, Iron.

PINS, INSULATOR, WOOD.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
Mineralac Electric Co., Chicago. "Unity" Insulator and Pin.

PIPE BENDERS. See Benders.

PIPE COVERINGS, STEAM.
American District Steam Co., Lockport, N. Y.
H. W. Johns-Manville Co., New York.

PIPE CUTTING MACHINES. See Machines, Pipe Threading and Cutting.

PIPE ENDS. See Fittings.

PIPE FITTING TOOLS.
Borden Co., Warren, Ohio. "Beaver".
Steel City Electric Co., Pittsburgh, Pa. "Steel City", "Thompson".
Armstrong Mfg. Co., Bridgeport, Conn.
L. S. Brach Supply Co., New York.
Butterfield & Co., Derby Line, Vt.
Curtis & Curtis Co., Bridgeport Conn.
Eck Tool Co., Chicago, Ill.
Vanderman Mfg. Co., Williamantic, Conn.

PIPE HANGERS. See Hangers & Clamps.

PIPE STRAPS. See Hangers & Clamps.

PLANTS, LIGHTING. See Lighting Plants.

PLATES, CONDUIT OUTLET.
Sprague Electric Wks., New York City.
Colgan Co., Wm. H., West Newton, Mass.
Renim Specialty Co., Brighton Station, Boston, Mass. ("Renim.")

PLATES, FLUSH SWITCH.
Arrow Electric Co., Hartford, Conn.
Central Telephone & Electric Co., St. Louis, Mo.
F. H. Lovell & Co., Arlington, N. J. "Double Eagle"
Machen & Mayer Elec'l Mfg. Co., Philadelphia, Pa. "M. & M."

PLATFORMS (Pole Seats).
F. Bissell Co., Toledo, Ohio.
Hubbard & Co., Pittsburgh, Pa.
Oshkosh Mfg. Co., Oshkosh, Wis.
Anderson Forge & Mach Co., Detroit, Mich.
Hallett Iron Works, Harvey, Ill.
Kinsey Mfg. Co., Toledo, Ohio.
M. Lanz & Sons, Pittsburgh, Pa.
Fred L. Meeckel, Chicago, Ill.
North Penn Iron Co., Philadelphia, Pa.

PLATINUM.
American Platinum Works, Newark, N. J.
Baker & Co., Inc., Newark, N. J.
J. Bishop & Co., Malvern, Pa.
Commercial Research Co., Tuckahoe, N. Y. (Platinum headed rivets.)
Thos. J. Dee & Co., Chicago, Ill.
Goldsmith Bros. Smelting & Refining Co., Chicago, Ill.
C. S. Platt, New York.
Roessler & Hasslacher Chemical Co., New York.
Jas. Schawel & Co., New York
Emil Schneider, Inc., Newark, N. J.

PLIERS, Wire Cutting.
Arrow Electric Co., Hartford, Conn. "Economy."
Cincinnati Tool Co., Cincinnati, Ohio. "Hargrave".
H. W. Johns-Manville Co., New York. (Insulated Handles.)
Mathias Klein & Sons, Chicago, Ill., "Goehst".
Smith & Hemenway Co., New York.
Western Electric Co., New York.
Bergman Tool Mfg. Co., Buffalo, N. Y. "B. B."
Billings & Spencer Co., Hartford, Conn.
C. E. Bonner Mfg. Co., Champaign, Ill. "Victor".
Bryant Electric Co., Bridgeport, Conn.
Crescent Tool Co., Jamestown, N. Y.
Cronk & Carrier Mfg. Co., Elmira, N. Y.
Dicke Tool Co., Downers Grove, Ill.
Erie Tool Works, Erie, Pa.
Industrial Novelty Co. Chicago, Ill. (Importers)
Montgomery & Co., New York. (Importers.)
C. S. Osborne & Co., Newark, N. J.
Peck, Stow & Wilcox Co., Southington, Conn.
Reed Mfg. Co., Erie, Pa.
Wm. Schollhorn Co., New Haven, Conn. "Bernard's".
Schuchardt & Schutte, New York. (Importers "Lindstrom", "S. & S.")
Utica Drop Forge & Tool Co., Utica, N. Y.
Vom Cleff & Co., New York. (Importers of Frye's Patent Splicing Pliers.)
Whitaker Mfg. Co., Chicago, Ill.

PLUG CUT-OUTS. See Cut-Outs.

PLUGS, Attachment. (See Attachment Plugs.)

PLUGS, Extension.
Phelps Mfg. Co., Detroit, Mich.

PLUGS, Fuse (See Fuse Plugs.)

PLUGS AND RECEPTACLES, Battery Charging.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
Delta-Star Electric Co., Chicago.
General Electric Co., Schenectady.
Metropolitan Engineering Co., Brooklyn, N. Y.
Universal Electric Stage Lighting Co., New York, N. Y. "Kliegl."
Russell & Stoll Co., New York.

PLUGS AND RECEPTACLES, Flush.
Arrow Electric Co., Hartford, Conn.
Chelten Elec. Co., Philadelphia.
General Electric Co., Schenectady.
Hart Mfg. Co., Hartford, Conn. "Diamond H".
Harvey Hubbell, Inc., Bridgeport, Conn. (Indicating Receptacles.)
Manhattan Electrical Supply Co., New York. "Mesco".
H. T. Paiste Co., Philadelphia, Pa. "Fielding."
Trumbull Electric Mfg. Co., Plainville, Conn.
Bryant Electric Co., Bridgeport, Conn. ("Chapman" and "Ruby" Sign Receptacle.)
Chicago Electric Mfg. Co., Chicago, Ill. "Handy".
Hart & Hegeman Mfg. Co., Hartford, Conn. "H. & H."
Machen & Mayer Elec'l Mfg. Co., Philadelphia, Pa. ("M. & M." Standard Indicating Heater Receptacles.)
Metropolitan Elec. Mfg. Co., Long Island City, N. Y.
Perkins Electric Switch Mfg. Co., Bridgeport, Conn.

PLUGS AND RECEPTACLES, Stage.
Frank Adam Electric Co., St. Louis, Mo.
General Electric Co., Schenectady, N. Y. (Double Ended Receptacle.)
Manhattan Electric Supply Co., New York.
Stanley & Patterson, New York "Fielding".
Universal Electric Stage Lighting Co., New York. "Kliegl".
Western Electric Co., New York
Chicago Elec. Mfg. Co., Chicago Ill. ("Handy" Stage Connectors.)
Condit Electrical Mfg Co., Boston, Mass.
Electric Stage Lighting Co., Chicago, Ill.
Russell & Stoll Co., New York
Tregoning Electric Mfg. Co. Cleveland, Ohio.

PLUGS, Condit. (Wood.)
C. H. Lever Mfg. Co., Chicago Ill.
Philadelphia Electrical Mfg. Co Philadelphia, Pa.
J. C. Wolf, Westville, N. J.

PLUGS, Spark.
Emil Grossman & Co., New York "Red Head".
Hartford Pump & Mfg. Co., Boston, Mass.
Heinze Elec. Co., Lowell, Mass
Jeffrey-Dewitt Co., Detroit, Mich "J. D.", "Reliance", "Edison Double System".
Long Bros., Kokomo, Ind.
C. A. Mezger, New York, "Sea Proof".
Milwaukee Auto Specialty Co., Milwaukee, Wis. "Victor". "Centre Fire".
A. R. Mosler & Co., New York "Beat-Em-All", "Triumph", "Split-Fire"
Never-Miss Mfg. Co., Lansing, Mich.
New York Mica & Mfg Co., Auburn, N. Y. "Wright".
Oakes & Dow Co., Boston, Mass "Sootless", "Comet".
Orswell Ignition Co., Boston Mass.
Rajah Auto Supply Co., Bloomfield, N. J.
Randall-Faichney Co., Boston "Bing".
Standard Co., Torrington, Conn "Breech Block".
Volcano Spark Plug Co., Ashland Ohio.

PNEUMATIC BRUSHES. See Brushes, Pneumatic, also Dusters.

POCKET METERS. See Gauges, Battery.

POLARITY INDICATORS See Instruments.

POLE MEASURING INSTRUMENT. See Instruments, Pole Measuring.

POLE ERECTORS.
W. N. Matthews & Bro., St. Louis, Mo.

POLES, Concrete.
American Steel & Wire Co., Chicago, Ill.
American Concrete Pole Co., Richmond, Ind.
Hollow Concrete Pole Co., Oklahoma City, Okla.
New York Pole Co., New York. (Reconstructing Tubular Iron Poles.)
Pettyjohn Co., Terre Haute, Ind. (Columns.)

POLES, Iron and Steel.
The Carbo Corporation, Chicago, Ill.
Bates Expanded Steel Truss Co., Chicago.
Casey-Hedges Co., Chattanooga, Tenn.
Central Foundry Co., New York City.
Columbia Machine Works & Malleable Iron Co., Brooklyn N. Y.
Diamond Steel Pole Co., Philadelphia, Pa. (Tapered.)
Electric Railway Equipment Co., Cincinnati, Ohio.
Franklin Steel Co., Franklin, Pa. "Tripartite".

Garford Co., Elyria, Ohio. "Shelby".
Elmer P. Morris, New York City.
National Tube Co., Pittsburgh, Pa.
R. D. Nuttall Co., Pittsburgh, Pa.
Philadelphia Elec. & Mfg. Co., Philadelphia, Pa.
Railway & Industrial Engineering Co., Pittsburgh, Pa.
Sectional Steel Pole Co., Minneapolis, Minn. (Sectional.)

POLES, Treated.
Lindsley Bros & Co., Spokane, Wash.
Page & Hill Co., Minneapolis, Minn.
Valentine-Clarke Co., Minneapolis, Minn.
W. P. Goltra Co., Cleveland, O.

POLES, Wood.
F. Bissell Co., Toledo, Ohio.
Bradley Timber & Railway Supply Co., Duluth, Minn.
Burk & Co., Dennis, Cabinet, Idaho.
Crawford Cedar Co., Menominee, Mich.
Deal Lumber Co., L. K., Des Moines, Ia.
Duluth Log Co., Duluth, Minn.
Fowler Co., John H., Chicago. (Cedar and Cypress.)
Humbird Lumber Co., Sandpoint, Idaho.
Larson Bros. Lumber Co., Minneapolis, Minn.
Lindsley Bros. Co., Spokane, Wash.
Mac Gillis & Gibbs, Milwaukee, Wis.
National Pole Co., Escanaba, Mich.
Naugle Pole & Tie Co., Chicago.
Page & Hill Co., Minneapolis, Minn.
Partridge Lumber Co., T. M., Minneapolis, Minn.
Sandpoint Lumber & Pole Co., Sandpoint, Idaho.
Southern Exchange Co., New York, N. Y.
Sterling & Son Co., W. C., Monroe, Mich.
Torrey Cedar Co., Clintonville, Wis.
Valentine-Clark Co., Minneapolis, Minn.
Western Electric Co., New York.
Zenith Cedar Co., Duluth, Minn.
Bell Lumber Co., Minneapolis, Minn.
B. J. Carney & Co., Grinnell, Ia.
Chattanooga Pole Co., Chattanooga, Tenn.
Cherry River Boom & Lumber Co., Richwood, W. Va.
Crescent Lumber Co., Pittsburgh, Pa.
Faris & Mayhew Lumber & Pole Co., Denver, Colo.
Goltra Tie Co., W. P., Cleveland, O.
Hoit Lumber Co., Oconto, Wis.
Maloney Bros., Spooner, Wis.
McCullough & Moss, Minneapolis, Minn.
Morrison Lumber Co., J. W., Minneapolis, Minn.
Pacific Coast Pole Co., Spokane, Wash.
Paducah Pole & Timber Co., Paducah, Ky.
Pendleton & Gilkey, Minneapolis, Minn.
Three States Cedar Co., Minneapolis, Minn.
Western Lumber & Pole Co., Spokane, Wash.
Wittenberg Cedar Co., Wittenberg, Wis.

POLES, Trolley.
American Bridge Co., New York.

POLE CHANGERS.
Current Electric Co., Chicago, Ill. "Standard".
Kellogg Switchboard & Supply Co., Chicago, Ill.
Homer Roberts Telephone Co., Chicago, Ill.
Sandwich Mfg. Co., Sandwich, Ill.
Warner Electric Co., Muncie, Ind.

POLE JACKS.
Templeton, Kenly & Co., Ltd., Chicago. "Simplex."

POLE SEATS AND LADDERS. See Platforms.

POLE STEPS.
American Steel & Wire Co., Chicago, Ill.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
Cutter Co., Geo., South Bend, Ind. (Removable only.)
Hubbard & Co., Pittsburgh, Pa.
Oshkosh Mfg. Co., Oshkosh, Wis.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Capital Elec. Co., Salt Lake City, Utah. "McBride".
Electric Railway Equipment Co., Cincinnati, Ohio.
Hoopes & Townsend Co., Philadelphia, Pa.
Inland Steel Co., Chicago, Ill.
M. Lanz & Sons, Pittsburgh, Pa.
Michigan Bolt & Nut Works, Detroit, Mich.
Republic Iron & Steel Co., Chicago, Ill.
Rockford Bolt Co., Rockford, Ill.
Strieby & Foote Co., Newark, N. J.
St. Louis Malleable Casting Co., St. Louis, Mo.

POLETOPS, Arc Lamp.
Geo. Cutter Co., South Bend, Ind.
Line Material Co., South Milwaukee, Wis.
Casey-Hedges Co., Chattanooga, Tenn.
Central Foundry Co., New York City.
Electric Railway Equipment Co., Cincinnati, Ohio.
Elmer P. Morris, New York City.

POLICE SIGNALS. See Fire Alarms.

POLISHERS AND BUFFERS, Motor Driven. (For portable forms, see Tools, Portable.)
Roth Bros. & Co., Chicago, Ill.
Diamond Machine Co., Providence, R. I.
Heard Machine Co., Worcester, Mass.

POLISHERS, Floor. See Floor Cleaners and Polishers.

POLISHERS, Shoe. (Motor Driven.)
Roth Bros. & Co., Chicago.
Burkhart Automatic Shoe Polishing Machine Co., Buffalo.
Reason Elec. Automatic Shoe Polishing Machine Co., Pontiac, Mich.

PORCELAIN, Special Shapes.
Cook Pottery Co., Trenton, N. J.
Findlay Elect. Porcelain Co., Findlay, O.
J. H. Parker & Son, Parkersburg, W. Va.
Pass & Seymour, Inc., Solvay, N. Y.
Peru Electric Co., Peru, Ind. "Peru."
Star Porcelain Co., Trenton, N. J.
Thomas & Sons, R., E.Liverpool,O.
Westinghouse Electric & Mfg. Co.
Colonial Sign & Insulator Co., Akron, Ohio.
Empire China Works, Brooklyn.
Hartford Faience Co., Hartford, Conn.
Imperial Porcelain Works, Trenton, N. J.

PORCELAIN, Standard. (Insulators, Knobs, Cleats, Tubes, Bushings.)
Cook Pottery Co., Trenton, N. J. (Wedge Split Insulators.)
Findlay Electric Porcelain Co., Findlay, O.
General Electric Co., Schenectady, N. Y.
Illinois Electric Porcelain Co., Macomb, Ill.
Locke Insulator Mfg. Co., Victor, N. Y.
J. H. Parker & Son, Parkersburg, W. Va.
Ohio Brass Co., Mansfield, Ohio. (Mine and Tunnel Insulators, Entrance Tubes.)
Pass & Seymour, Inc., Solvay, N. Y.
Star Porcelain Co., Trenton, N. J.
Thomas & Sons, R., E.Liverpool,O.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co.
White Co., T. C., St. Louis, Mo.
E. H. Ball & Co., Cedar Rapids, Iowa. (Cleats.)
Benbow Co., Cincinnati, Ohio. (Mine Insulators.)
Colonial Sign & Insulator Co., Akron, Ohio. "Murdock" Cleats.
General Porcelain Co., J. H. Parker & Son, Sales Agents, Parkersburg, W. Va.
Hartford Faience Co., Hartford, Conn.
Imperial Porcelain Works, Trenton, N. J. ("Duggan" Cleats.)
Locke Insulator Mfg. Co., Victor, N. Y.
Paragon Electric Co., Chicago, Ill. (Self-Tying Knob.)
Peru Electric Co., Peru, Ind.
Snyder-Hunt Co., Belle Plaine, Iowa. (Insulators.) (Cleats and Knobs.)
Union Porcelain Works, Brooklyn, N. Y.
Universal Specialty Co., Terre Haute, Ind. (Special Insulators.)
Weber Elec. Co. (Henry D. Sears, Gen'l Sales Agt., 131 State St., Boston, Mass.) (Cleats and Knobs.)

POROUS CUPS. See Cups.

POROUS JARS.
Colonial Sign & Insulator Co., Akron, Ohio.

PORTABLE FANS. See Fans.

PORTABLE GUARDS. See Guards.

PORTABLES. Electric Reading Lamps, Portables, Floor Portables.
Chicago Reed Ware Mfg. Co., Chicago.
Faries Mfg. Co., Decatur, Ill.
Franks Mfg. Co., Rock Island, Ill.
General Electric Co., Schenectady, N. Y.
Ideal Lamp Mfg. Co., Faribault, Minn.
H. W. Johns-Manville Co., New York.
Leindorf Electric Light Co., Inc., New York City.
Metal Specialties Mfg. Co., Chicago, Ill.
Usona Mfg. Co., New York City.
Wallace Novelty Co., New York City.
Acme Metal Mfg. Co., Chicago, Ill.
Amboy Works, New York, N. Y.
Art Brass & Fixture Mfg. Co., McKees Rocks, Pa.
Bradley & Hubbard Mfg. Co., Meriden, Conn.
Chicago Lamp & Fixture Co., Chicago, Ill.
Cincinnati Artistic Wrought Iron Works, Cincinnati, Ohio.
Colonial Art Glass Co., Chicago.
Dale Co., The, New York, N. Y.
Excelsior Brass Works, Reading, Pa.
Flanagan & Biedenweg Co., Chicago, Ill.
Fulper Pottery Co., Flemington, N. J.
Gall-Webb Mfg. Co., Buffalo, N. Y.
Gold Furniture Co., Chicago, Ill.
Goodwin & Kintz Co., Winsted, Conn.
Goshen Stamping & Brass Co., Goshen, Ind. "Security".
Gudeman & Co., New York, N. Y. (Decorative.)
Handel Co., Meriden, Conn.
Herwig Art Lamp Shade Co., Chicago, Ill.
Andrew H. Hoag Co., New York.
Imperial Art Glass & Lamp Works, New York, N. Y.
Lynch Co., Geo. C., New York.
McFaddin Co., H. G., New York, N. Y. "Emeralite".
McKenney & Waterbury Co., Boston, Mass. "Harrigan".
McLeod, Ward & Co., New York, N. Y. "Kinsman".
Edward Miller & Co., Meriden, Conn.
Morgan & Sons, John, New York.
Morse, Frank W., Boston, Mass. "Electrofier"
Neuhauser Co., D. L., Chicago.
Noe & Sons, Wm. R., New York.
Paragon Electric Co., Chicago.
Patterson Tool & Supply Co., Dayton, Ohio.
Pefco Sales Co., Peoria, Ill.
Pittsburgh Lamp Brass & Glass Co., Pittsburgh, Pa.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rostetter & Son, Fort Wayne, Ind.
Salo Mfg. Co., Binghamton, N. Y.
Schuler Art Glass Co., Chicago.
A. J. Scribner, Gloversville, N. Y.
St. Louis Brass Mfg. Co., St. Louis, Mo.
Stavenhagen Co., W. H., Town of Union, N. J.
Stehlin-Miller & Henes Co., New York, N. Y. "Rockoff".
Tietgen, Falk & Co., Chicago, Ill.
Turner & Seymour Mfg. Co., Torrington, Conn.
Unique Art Glass & Metal Co., Brooklyn, N. Y.
Wappler Electric Mfg. Co., New York.
Weintraub Brass Mfg. Co., New York, N. Y.
Wells Light Co., Jersey City, N. J. "Wallworks".
Phoenix Glass Co., New York.
Western Lamp & Brass Works, Chicago, Ill.
Whaley & Co., J. A., New York.
O. C. White Co., Worcester, Mass.
L. A. Williamson Co., New York. "Flexilyte."

POSTS, Lamp Arc, Tungsten.
Carbo Steel Post Co., Chicago.
Central Electric Co., Chicago, Ill.
Cutter Co., Geo., South Bend, Ind.
Delta-Star Electric Co., Chicago.
Fleur City Ornamental Iron Works, Minneapolis, Minn.
King Foundry Co., St. Joseph, Mo.
Line Material Co., South Milwaukee, Wis. "Mitre." "Ionic."
McDonnell Iron Works, Des Moines, Ia.
Metropolitan Engineering Co., New York City.
Southern Foundry Co., Owensboro, Ky.
Casey-Hedges Co., Chattanooga, Tenn.
Central Foundry Co., New York City.
Cheesman & Co., M. V., Mishawaka, Ind.
Cross Bros. Iron Wks., Eugene, Ore.
Dearborn Foundry Co., Chicago.
Des Moines Electric Contracting Co., Des Moines, Ia.
Electric Railway Equipment Co., Cincinnati, Ohio.
Fiske Iron Works, J. W., New York, N. Y.
Kramer Bros. Foundry Co., Dayton, Ohio.
Love Bros., Aurora, Ill.
Lundin Elec. & Mach. Co., Boston, Mass.
Fred J. Meyers Mfg. Co., Hamilton, Ohio.
Minneapolis Steel & Machinery Co., Minneapolis, Minn.
Elmer P. Morris, New York City.
J. L. Mott Iron Works, New York.
Ornamental Lighting Pole Co., New York.
Paxton & Vierling Iron Co., Omaha, Neb.
Pettyjohn Co., Terre Haute, Ind. (Reinforced Granite Concrete.)
Philadelphia Elec. & Mfg. Co., Philadelphia, Pa.
Smyser-Royer Co., Philadelphia.
Southern Wheel Co., St. Louis, Mo.
St. Paul Foundry Co., St. Paul.
Union Metal Mfg. Co., Canton, Ohio.
Wallace Machine & Foundry Co., Lafayette, Ind.
Western Gas Cons. Co., Fort Wayne, Ind. "Ionic".

POSTS, Binding. See Binding Posts.

POTENTIOMETERS.
Leeds & Northrup Co., Philadelphia, Pa.
Queen-Gray Co., Philadelphia, Pa.

POTHEADS AND SLEEVES, Pothead Brackets.
F. Bissell Co., Toledo, Ohio.
Brady Electric Mfg. Co., New Britain, Conn.
Central Electric Co., Chicago, Ill.
Delta-Star Electric Co., Chicago.
Electrical Engineers Equipment Co., Chicago, Ill.
Fairmount Elec. & Mfg. Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
General Devices & Fittings Co., Chicago, Ill.
Okonite Co., The, New York. "Candee".
Schweitzer & Conrad, Inc., Chicago.
Standard Underground Cable Co., Pittsburgh, Pa.
Colonial Sign & Insulator Co., Akron, Ohio. (All Porcelain Potheads.)
G. & W. Elec. Specialty Co., Chicago, Ill. (Porcelain.)
Mineralac Electric Co., Chicago.
Hickey & Schneider, New York, N. Y.
Moon Mfg. Co., Chicago, Ill. (Self-Soldering.)

POWER FACTOR METERS. See Instruments.

PRESERVATIVES, Wood.
Carbolineum Wood Preserving Co., Milwaukee, Wis.
General Bakelite Co., New York.
Lindsley Bros. Co., Spokane, Wash.
American Mfg. Co., Minneapolis, Minn. "Creoseptine".
American Wood Preserving Co., Chicago, Ill. "Antiseptine".
Anthracenol Wood Preserving Co., New York. "Barol".
Atlas Preservative Co. of America, New York.
L. S. Brach Supply Co., New York.
C. A. Wood Preserver Co., St. Louis, Mo.
Cabot, Samuel, Boston, Mass. "Conservo".
Di-Electric Mfg. Co., St. Louis, Mo. "Phenoleum".
Grosche & Co., Bruno, New York. "S. B. F. Carbolineum".
Indiana Refining Co., Cincinnati, Ohio. "Timbersphalt".
Missouri Black Enamel & Paint Co., St. Louis, Mo. "Keystone".
Patton Paint Co., Milwaukee, Wis.
U. S. Wood Preserving Co., New York.
Universal Pole & Post Preserving Co., Circleville, Ohio.

PRESSES, Coil. See Coil Forming Devices.

PRESSES, Power. For Punching Out Discs and Segments.
Bliss Co., E. W., Brooklyn, N. Y.
Cleveland Punch & Shear Works, Cleveland, Ohio.
Ferracute Mach. Co., Bridgeton, N. J.
Hilles & Jones Co., Wilmington, Del.

Long & Allstatter Co., Hamilton, Ohio.

PRESSURE GAUGES. (Electric Alarm.)

Bristol Company, Waterbury, Conn.
A. C. Scribner, Gloversville, N. Y.

PRINTERS' AND BOOKBINDERS' MACHINERY. (Motor Driven.)

American Folding Machine Co., Cleveland, Ohio.
Amer. Type Founders Co., Boston, Mass. (Stitching Machines.)
Automatic Coinwrapping Machine Co., New York. (Mailing Machines.)
Barnhart Bros. & Spindler Co., New York. (Saw Trimmers.)
Buffum Tool Co., Louisiana, Mo. (Automatic Printing Presses.)
Chambers Brass Co., Philadelphia, Pa. (Paper Folding Machines.)
Dexter Folding Co., Pearl River, N. Y. (Folding Machinery.)
Hickok Mfg. Co., W. O., Harrisburg, Pa. (Book Binders' Machinery.)
Latham Machinery Co., Chicago, Ill. (Stitchers.)
Mergenthaler Linotype Co., New York. (Typesetting and Casting Machines.)
Miehle Printing Press & Mfg. Co., Chicago, Ill. (Printing Presses.)
Murray Machinery Co., Kansas City, Mo. (Photoengraving, Electrotype and Color Press Machinery.)
Pan-Electric Mfg. Co., St. Louis, Mo. (Job Press Outfits.)
Rosback Co., F. P., Benton Harbor, Mich. (Perforators and Stitchers.)
Roth Tool Co., B., St. Louis, Mo. (Embossing Presses.)
Royle & Sons, John, Paterson, N. J. (Routing Machines.)
Unitype Co., Brooklyn, N. Y. (Typesetting Machines.)
Wagenhorst & Co., J. H., Youngstown, Ohio.
Wesel Mfg. Co., F., New York. (Trimming and Shaving Machines.)

PRINTING ATTACHMENTS FOR METERS.

Minerallac Electric Co., Chicago.

PRISMS.

See Crystals.

PRODUCERS, Gas.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Chicago, Ill.
Westinghouse Machine Co., East Pittsburgh, Pa.
Amsler Engrg. Co., Pittsburgh, Pa.
DuBois Iron Works, DuBois, Pa.
Fulper Pottery Co., Flemington, N. J.
Gas Machinery Co., Cleveland, Ohio.
Gates Potteries, Terra Cotta, Ill.
Industrial Power Co., Milwaukee, Wis. "Atkinson".
Minneapolis Steel & Mch. Co., Minneapolis, Minn.
New York Engine Co., New York, N. Y.
Power & Mining Machinery Co., New York, N. Y. "Loomis-Pettibone".
Sheffield Gas Power Co., Kansas City, Mo.
Western Gas Engine Co., Los Angeles, Calif.
Wile Power Gas Co., Rochester, N. Y.
Wood & Co., R. D., Philadelphia.

PROJECTORS, Electric. (Search Lights.) **For Stage Projectors. See Stage.**

Fort Wayne Electric Works, Ft. Wayne, Ind.
General Electric Co., Schenectady, N. Y.
Niagara Searchlight Co., New York.
Western Electric Co., New York.
Bogue Electric Co., C. J., New York, N. Y.
Carlisle & Finch Co., Cincinnati, Ohio.
Condit Elecl. Mfg. Co., New York, N. Y.
Rushmore Dynamo Works, Plainfield, N. J.
Silvey Electric Co., Dayton, O.

PROJECTORS, Post Card.

Victor Animatograph Co., Inc., Davenport, Ia.

PROJECTORS, Sign.

Electro Ad-Lite Co., New York.
General Electric Co., Schenectady, N. Y.
Pittsburg Electric Specialties Co., Pittsburgh, Pa.

PROJECTORS, Telephone. (See also Fuses, Telephone.)

D & W Fuse Co., Providence, R. I.
Frank B. Cook, Chicago.
Homer Roberts Mfg. Co., Chicago, Ill.

PULL CHAIN INSULATORS.

See Insulators.

PULL SOCKETS. See Sockets.

PULLEYS, Arc Lamp. (See also Pulleys, Cutout.)

George Cutter Co., South Bend, Ind.
Fort Wayne Elec. Works, Fort Wayne, Ind.
Line Material Co., South Milwaukee, Wis.
Western Electric Co., New York.
Fletcher Mfg. Co., Dayton, Ohio.
Electrical Construction Supply Co., Springfield, Ohio.
Philadelphia Elec. & Mfg. Co., Philadelphia, Pa.

PULLEYS, Cutout. (For Arc Lamps.)

Geo. Cutter Co., South Bend, Ind.
Line Material Co., South Milwaukee, Wis.
Western Electric Co., New York.
National Sewing Machine Co., Belvidere, Ill. "Mayo", "Belvidere."
Thompson Electric Co., Cleveland, O.

PULLEYS, Paper.

Rockwood Mfg. Co., Indianapolis.

PULLEYS, Wood.

Bradford Belting Co., Cincinnati, Ohio. "Monarch".
Detroit Wood Pulley Co., Detroit, Mich.
Dodge Mfg. Co., Mishawaka, Ind. "Independence".
Donegan & Swift, New York, N. Y. "Swifts".
Keasey Pulley Co., Toledo, Ohio.
Medart Patent Pulley Co., St. Louis, Mo.
Ohio Pulley Co., Marion, Ohio. "Buckeye".
Ohio Valley Pulley Works, Maysville, Ky. "Limestone".
Oneida Steel Pulley Co., Oneida, N. Y.
Paul Mfg. Co., Fort Wayne, Ind
Reading Wood Pulley Co., Reading, Pa.
Reeves Pulley Co., Columbus, Ind.
Saginaw Mfg. Co., Saginaw, Mich. "Gilbert".
South Bend Pulley Co., South Bend, Ind.
Wing & Co., J. T., Detroit, Mich. "Detroit".

PULLS, Socket. See Attachments.

PULMOTORS.

Draeger Oxygen Apparatus Co., Pittsburgh, Pa.

PUMPS, Air and Vacuum. (See also Brushes, Pneumatic), and Garage Pumps.

Bishop - Babcock - Becker Co., Cleveland, Ohio. ("Eureka" Air Pumps.)
Brunner Mfg. Co, Utica, N. Y.
A. M. Carron, Pittsburgh, Pa.
Connersville Blower Co., Connersville, Ind. (Vacuum.)
Connellsville Machine & Car Co., Connellsville, Pa. (Vacuum.)
Dal Mfg. Co., Chicago, Ill. (Tire Pumps.)
Gearless Automatic Pump Co., Rock Island, Ill.
Kellogg Mfg. Co., Rochester, N. Y. (Auto Tire.)
Leiman Bros., New York. (Vacuum.)
Palm Engineering Co., Detroit, Mich. (Vacuum.)
Pittsburgh Automatic Air Pump Co., Pittsburgh, Pa.
Siebert-Welch Co., Columbus, O.

PUMPS, Beer.

Brown Beer Pump Co., R. E., Boston, Mass.
Iowa Mfg. Co., Oskaloosa, Iowa.
Varwig Mfg. Co., Cincinnati, Ohio.

PUMPS, Water.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Wis. (High Duty Pumping Engines.)
Marelli & Co., Ltd., Erecte, New York. (Centrifugal.)
Advance Pump & Compressor Co., Battle Creek, Mich.
Alberger Condenser Co. New York. (Centrifugal.)
Allentown Rolling Mills, Allentown, Pa. "Aldrich". Pumps).
American Steam Pump Co., Battle Creek, Mich. "Marsh".
American Well Works Aurora, Ill.
Automatic Rotary Pump Co., New York, N. Y.
Barnes Mfg. Co., Mansfield, Ohio. (Power Only.)
Beach-Russ Co., Brooklyn, N. Y. (Rotary.)
Blackmer Rotary Pump Power Mfg. Co., Petoskey, Mich. (Water Pumps.)
Blake Pump & Condenser Co., Fitchburg, Mass.
Blakeslee Mfg. Co., Duquoin, Ill.
Bliss Co., E. W., Brooklyn, N. Y. "Marbourg".
Buffalo Steam Pump Co., Buffalo.
A. S. Cameron Steam Pump Works, N. Y.
Canton-Hughes Pump Co., Canton, Ohio.
Centrifugal Pump Co., New York, N. Y. (Silent Elec. Centrifugal House Pump.)
Chambersburg Engrg. Co., Chambersburg, Pa.
Chicago Pump Co., Chicago, Ill.
Columbus Steam Pump Works, Columbus, Ohio.
Davidson, M. T., New York.
Dayton Hydraulic Machinery Co., Dayton, Ohio. (Turbine.)
Dean Bros. Steam Pump Co., Indianapolis, Ind.
De Laval Steam Turbine Co., Trenton, N. J. (Centrifugal.)
Deming Co., Salem, Ohio.
Douglas, W. & B., Middletown, Conn.
Dow Pumping Engine Co., Geo. E., San Francisco, Calif.
DuBois Iron Works, DuBois, Pa.
Epping-Carpenter Co., Pittsburgh, Pa.
Erie Pump & Engine Works, Erie, Pa. (Turbine.)
Erwin & Co., Chicago, Ill. (Triplex.)
Evans & Co., C. H., San Francisco, California. "Thompson & Evans".
Fairbanks, Morse & Co., Chicago.
Fort Wayne Engrg. & Mfg. Co., Fort Wayne, Ind. ("Paul" House Pump.)
Foster Pump Works, Brooklyn, N. Y. "Hardick".
Franklin Iron Works, Pottsville, Pa.
Gardner-Governor Co., Quincy, Ill.
Globe Mfg. Co., Battle Creek, Mich.
Goulds Mfg. Co., Seneca Falls, N. Y. (Power.)
Goyne Steam Pump Co., Ashland, Pa.
Grant Iron Works, Mahanoy City, Pa.
Guild & Garrison, Brooklyn.
Hall Steam Pump Co., Allegheny, Pa.
Harris Pump & Supply Co., Pittsburgh, Pa.
Heisler Co., St. Marys, Ohio.
Hill Machine Co., Anderson, Ind. (House Pumps.)
Holland Machine Co., New York.
Hooker Steam Pump Co., St. Louis, Mo.
International Steam Pump Co., New York, N. Y. "Deane", "Blake", "Jeansville", "Show", "Knowles", "Laidlaw-Dunn-Gordon", "Prescott", "Worthington".
Jackson Byron Iron Works, Berkeley, Cal. (Sinking Pumps.)
Janette Mfg. Co., Chicago, Ill.
Jarvis Engine & Machine Works, Lansing, Mich. "House Pumps".
Jeffrey Mfg. Co., Columbus, Ohio. (Mine Only.)
Benj. F. Kelley & Son, New York.
Kerr Turbine Co., Wellsville, N. York. (Turbo Pumps.)
Lea Equipment Co., New York. (Turbine.)
Lucas Pump Co., Dayton, Ohio. ("Best-yet" Power Pump.)
Luitwieler Pumping Engine Co., Rochester, N. Y.
Manistee Iron Works Co., Manistee, Mich.
Mason Regulator Co., Boston.
Mast, Foos & Co., Springfield, Ohio. ("Buckeye" Power only.)
John H. McGowan Co., Cincinnati, Ohio.
Samuel L. Moore & Sons, Elizabeth, N. J.
Morris Machine Works, Baldwinsville, N. Y.
Mutual Beer Pump Co., New York.
F. E. Myers & Bro., Ashland Ohio.
National Steam Pump Co., Upper Sandusky, Ohio.
Frank L. Patterson & Co., New York.
Pattin Bros. Co., Marietta, Ohio
Platt Iron Works Co., Dayton, Ohio. "Smith-Vaile".
Reliance Machine & Tool Works St. Louis, Mo. "Hooker".
Rider-Ericsson Engine Co., New York. ("Reco" House Pump.)
Geo. J. Roberts Co., Dayton, Ohio.
P. H. & F. M. Roots Co., Connersville, Ind.
Rotary House Pump Co., New York. "Von Pittler".
Roth Mfg. Co., Columbus, Ind.
Rumsey & Co., Ltd., Seneca Falls, N. Y. (Power only.)
Sanitary Pump Co., Dayton, O.
Schaefer Bros. Co., Chicago, Ill.
Scranton Steam Pump Co., Scranton, Pa.
Service Pump Co., Orrville, Ohio "Conkell".
Star Pump Co., Boston, Mass.
Stewart Heater Co., Buffalo.
Taber Pump Co., Buffalo, N. Y. (Rotary.)
Thomas & Smith, Chicago, Ill. ("Economy" House Pump.)
Twinvolute Pump & Mfg. Co., New York, N. Y.
Union Steam Pump Co., Battle Creek, Mich. "Burnham", "Moore".
United Pump & Power Co., Chicago, Ill. (Water Pump.)
Vaile-Kimes Co., Dayton, O.
Victor Electric Co., Chicago, Ill.
Walker Mfg. Co., Fenton, Mich.
Warren Steam Pump Co., Warren, Mass.
Weinman Pump Mfg. Co., Columbus, Ohio. (House Service.)
C. H. Wheeler Mfg. Co., Philadelphia, Pa.
Wickes Bros., Saginaw, Mich.
Wilkinson Foundry & Mfg. Co., Bridgeport, Pa.
Wilson-Snyder Mfg. Co., Pittsburgh, Pa.
R. D. Wood & Co., Philadelphia, Pa. (Centrifugal.)
Yeomans Bros., Chicago, Ill.
E. R. Young & Sons, Titusville, Pa. "Locke".

PUMPING SYSTEMS, Electro Pneumatic.

Sanitary Pump Co., Dayton Ohio.

PUSH BUTTONS.

Central Electric Co., Chicago, Ill.
Chicago Glass Novelty Co., Marion, Ind.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Pass & Seymour, Inc., Solvay, N. Y. "No Scru".
Manhattan Electrical Supply Co., New York. "Reliable" (Fleet Thread).
W. R. Ostrander & Co., New York.
U. S. E. M. Co., New York. (Nongrounding.)
Western Electric Co., New York N. Y.
American Car & Ship Hardware Co., New Castle, Pa.
Ansonia Electrical Co., Ansonia, Conn.
Albert Bohm, New York. (Imported.)
Bunnell & Co., J. H., New York N. Y.
Cleveriy Electric Works, Philadelphia, Pa.
P. & F. Corbin, New Britain Conn.
S. H. Couch Co., Boston, Mass. "Pushrite", "Workrite".
De Veau Tele. Mfg. Co., Brooklyn, N. Y. "Auth."
Edwards & Co., New York. "Neverlite," "Midget, Jr."
Electric Goods Mfg. Co., Canton Mass.
Holtzer-Cabot Electric Co. Brookline, Mass.
Francis Keil & Son, New York "Anti-Wood," "Anti-Screw Midget."
Long Island Electrical & Machine Works, Richmond Hill, N. Y
Minerallac Electric Co., Chicago.
Wm. J. Murdock Co., Chelsea, Mass.
Partrick, Carter & Wilkins Co., Philadelphia, Pa.
Reading Hardware Co., Reading Pa.
Russell & Erwin Mfg. Co., New Britain, Conn.
Sargent & Co., New York.
I. S. Spencer's Sons, Guilford Conn.
Union Hardware Co., Torrington Conn.
A. H. Warner & Co., Bristol Conn.
Wilhelm, H., Brooklyn, N. Y.

PYROMETERS, Electric.

Bristol Co., Waterbury, Conn.
Esterline Co., The, Indianapolis Ind.
Leeds & Northrup Co., Philadelphia, Pa.

Thompson-Levering Co., Philadelphia, Pa. "Peerless".
American Steam Gauge & Valve Co., Boston, Mass.
Ashcroft Mfg. Co., New York
Brown Instrument Co., Philadelphia, Pa.
E. Du Vivier, New York. (Importers. "Richard" Recording.)
Hoskins Mfg Co., Detroit, Mich
Industrial Instrument Co., Foxboro, Mass.
Keystone Electrical Instrument Co., Philadelphia, Pa.
Morse Thermo-Gage Co., Ithaca, N. Y.
Price Electric Co., Cleveland, Ohio.
Queen-Gray Co., Philadelphia, Pa.
Taylor Instrument Company, Rochester, N. Y. "Tycos".
Thwing Instrument Co., Philadelphia, Pa.
Wilson-Maulen Co., New York. ("Fery" Electric. "Advance".)

RACKS AND RINGS, Telephone Distributing.
F. Bissell Co., Toledo, Ohio.
Hubbard & Co., Pittsburg, Pa.
Frank B. Cook, Chicago.
T. J. Cope, Estate, Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hallett Iron Works, Harvey, Ill.
Kinsey Mfg. Co., Toledo, Ohio.
North Penn Iron Co., Philadelphia, Pa.
Charles Nuhring & Bro., Cincinnati, Ohio. "Underwriters." "Safety."
Star Expansion Bolt Co., New York.

RACKS, Cable. (See Cable Racks.)

RACKS, CARBOY.
McCord & Co., Horace M., Minneapolis, Minn.

RADIATORS, Luminous.
General Electric Co., Schenectady.
Rutenber Electric Co., Logansport, Ind.
American Electrical Heater Co., Detroit Mich
Lee Electric Radiator Co., Chicago.
Rathbone & Panigot Co., Grand Rapids, Mich.
Simplex Engineering Co., Philadelphia, Pa. "Quartzalite."

RAIL BONDS.
American Steel & Wire Co., Chicago.
General Electric Co., Schenectady.
H. W. Johns-Manville Co., New York, N. Y.
Ohio Brass Co., Mansfield, Ohio.
Rail Joint Co., New York, N. Y.
Western Electric Co. New York.

RAIL BOND TESTERS.
Roller-Smith Co., New York.

RAIL JOINTS.
American Steel & Wire Co., Chicago.
Ohio Brass Co., Mansfield, O.
Rail Joint Co., New York, N. Y.
Western Electric Co., New York.

RAILWAY SPECIALTIES, Electric.
Ohio Brass Co., Mansfield, Ohio.

RANGES, ELECTRIC.
Globe Stove & Range Co., Kokomo, Ind.
Hughes Electric Heating Co., Chicago.
Simplex Electric Heating Co., Cambridge, Mass.

REAMERS, Pipe. (See Pipe Fitting Tools.)

RECEPTACLES, Floor. (See Boxes, also Stage Plugs and Receptacles.)

RECEPTACLES, Sign.
Arrow Electric Co., Hartford, Conn. "Arrow E."
Benjamin Electric Mfg. Co., Chicago, Ill.
Federal Sign System (Electric), Chicago.
General Electric Co., Schenectady, N. Y.
H. T. Paiste Co., Philadelphia, Pa. "Fielding."
Pass & Seymour, Inc., Solvay, N. Y.
Peru Electric Co., Peru, Ind.
Stanley & Patterson, New York. "New Code".
Union Electric Co., Trenton, N. J.
Western Electric Co., New York.
Betts & Betts Corporation, New York. "Dyke".
Bryant Electric Co., Bridgeport, Conn.
Crouse-Hinds Co., Syracuse, N. Y. "Conduletto", "Norbitt".
H. H. Freeman Electric Co., Trenton, N. J. "Russell".
Perkins Electric Switch Mfg. Co., Bridgeport, Conn.
Tregoning Electric Mfg. Co., Cleveland, Ohio

RECEPTACLES, Standard See Sockets and Receptacles.

RECEPTACLES, Waterproof, Lamp-Enclosing. See Marine Fixtures.

RECEPTACLES, Weatherproof.
Arrow Electric Co., Hartford, Conn. "Arrow E."
Electric Appliance Co., Chicago, Ill. "Easo Watlight."
Federal Sign System (Electric), Chicago, Ill.
General Electric Co., Schenectady, N. Y.
H. T. Paiste Co., Philadelphia.
Pass & Seymour, Inc., Solvay, N. Y. "P. & S."
Stanley & Patterson, New York.
Universal Electric Stage Lighting Co., New York, N. Y. "Kliegl."
Western Electric Co., New York.
Bryant Electric Co., Bridgeport, Conn.
E. H. Freeman Electric Co., Trenton, N. J. "Circle F."
Harter Mfg. Co., Chicago. "Harter."
Mechanical & Electrical Mfg. Co., Chicago, Ill. "Memco."

RECORDERS, Combustion.
Precision Instrument Co., Detroit, Mich. "Simmance-Abady".
Sarco Fuel Savings & Engineering Co., New York.
Uehling Inst. Co., Passaic, N. J.

RECORDERS, Time.
Bristol Company Waterbury, Conn.
Calculagraph Co., New York.
Western Electric Co., New York.

RECTIFIERS, Current. (For charging storage batteries).
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland.
Wagner Elec. Mfg. Co., St. Louis, Mo. (Rotary, Vibrating).
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. ("Cooper Hewitt" Mercury Arc), (Electrolytic).
American Battery Co., Chicago, Ill. (Electrolytic.)
J. F. Ashbrook, Chicago, Ill. "Johns".
Como Electric Co., Spring Lake, N. J. "Hickley".
C. E. Cook Electric Co., Los Angeles, Calif.
Edison, Inc., Thomas A., Orange, N. J. "Edison."
Electric Economy Co., Roxbury, Boston, Mass.
Mohawk Electric Mfg. Co., Newark, N. J. (Electrolytic and Vibrating.)
Wm. Meyer Co., Chicago, Ill.
Murphy Electricity Rectifier Co., Rochester, N. Y.
Birch Elec. Testing Laboratories, Los Angeles, Calif.
United Electric Apparatus Co., Boston, Mass.
Victor Electric Co., Chicago, Ill.

REEL STANDS.
Device Improvement Co., Hanover, Pa.

REELS, Wire, Pay Out, Take Out.
Mathias Klein & Sons, Chicago.
Minneapolis Elec. & Const. Co., Minneapolis, Minn.
Oshkosh Mfg. Co., Oshkosh, Wis.
Western Electric Co., New York.

Wiring Equipment Co., New York City.
Anderson Tool & Supply Co., Detroit, Mich.
T. J. Cope, Estate, Philadelphia, Pa.
Dicke Tool Co., Downers Grove, Ill.
W. F. Irish Electric Co., New York.
The Kinsey Mfg. Co., Toledo, O
Fred L. Meckel, Chicago, Ill.
U. S. Bobbin & Shuttle Co., Providence, R. I.
John J. Waldman, New York.

REELS AND SPOOLS, Empty.
American Pulley Co., Philadelphia, Pa.
Frank Mossberg Co., Attleboro, Mass. (Metal.)

REFLECTORS, Glass. See Glassware.

REFLECTORS, Metal. See Shades, also Fixtures, Show Case.

REFLECTORS, Mirror.
Holophane Works of General Electric Co., Cleveland O.
Johns-Manville Co., H. W., New York.
Pittsburgh Reflector & Illuminating Co., Pittsburgh, Pa.
Western Electric Co., New York.
Universal Electric Stage Lighting Co., New York, N. Y. "Kliegl."
American Reflector & Ltg. Co., Chicago, Ill. "Paragon".
Bailey Reflector Co., Pittsburgh.
Chicago Lamp & Fixture Co., Chicago, Ill. "Block's Brilliant".
Consolidated Sheet Metal Works, Milwaukee, Wis.
Klemm & Co., Philadelphia, Pa.
National X-Ray Reflector Co., Chicago, Ill. "I-Comfort," "X-Ray," "Scoop," "Helmet," "Poke Bonnet."
Overbagh & Ayres Mfg. Co., Chicago, Ill. "Oamco"
Partridge, W. W., Chicago, Ill.
Reynolds Electric Flasher Mfg. Co., Chicago. (For lighting billboards.)
Sidley Co., Thos. H., Chicago.
Sunlight Reflector Co., Brooklyn.
Tea Tray Co., Newark, N. J.
Weeks, Nelson, New York, N. Y.
Western Reflector Chicago.

REFRIGERATORS AND ICE MACHINES (Electric).
H. W. Johns-Manville Co., New York.
Triumph Ice Machine Co., Cincinnati, Ohio.
Automatic Refrigerating Co., Hartford, Conn.
Baker Ice Machine Co., Omaha.
Brecht Co., St. Louis, Mo.
Brunswick Refrigerating Co., New Brunswick, N. J.
Carbondale Machine Co., Carbondale, Pa. (Exhaust Steam Ice Machine.)
Cleveland Ice Machine Co., Cleveland, Ohio.
De La Vergne Machine Co., New York.
Ruemmeli-Dawley Mfg. Co., St. Louis, Mo.
Wegner Machine Co., Buffalo.
Fred W. Wolf Co., Chicago, Ill.
York Mfg. Co., York, Pa.

REGISTERS, Telephone. See Meters.

REGULATORS, Feed Water.
Roche Engineering Co., Philadelphia.
Northern Equipment Co., Chicago.

REGULATORS, Temperature.
Stanley & Patterson, New York.
Johnson Electric Service Co., Milwaukee, Wis.
Powers Regulator Co., Chicago.
C. J. Tagliabue Co., New York.

REGULATORS, Voltage.
Electric Controller & Mfg. Co., Cleveland, Ohio.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland.
Condit Elect. Mfg. Co., Boston, Mass. (Alt. Current.)
Gilmore Electric Co., Boston, Mass. "Chapman".
Hartman Electrical Mfg. Co., Mansfield, Ohio.
Portland Co., Portland, Me. "W. M. C."

REPAIRS, Armature.
Boustead Electric & Mfg. Co., Minneapolis, Minn.
Commonwealth Edison Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

REPLACERS, Inc. Lamp. See Lamp Changers or Replacers.

RESISTANCE COILS. See Coils.

RESISTANCE, Banks and Units.
Allen-Bradley Co., Milwaukee, Wis.
Badt-Westburg Electric Co., Inc., Chicago.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Dixon Crucible Co., Joseph, Jersey City, N. J.
General Electric Co., Schenectady, N. Y.
Industrial Controller Co., Milwaukee, Wis.
Sprague Electric Works, New York.
Sundh Electric Co., New York.
Ward Leonard Electric Co., Bronxville, N. Y.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wirt Co., Germantown, Pa. "Dielite."
Dubilier Elec. Co., Inc., New York, N. Y.
Hoskins Mfg Co., Detroit, Mich
Railway & Industrial Engineering Co., Pittsburgh, Pa.
United Electric Apparatus Co., Boston, Mass.

RESISTANCE WIRE & RIBBON.
American Steel & Wire Co., Chicago, Ill.
Belden Mfg. Co., Chicago, Ill.
Driver-Harris Wire Co., Harrison, N. J.
"Climax," "S. R.," "Advance," "Nichrome", "Hercules".
Dubilier Elec. Co., Inc., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Moore, Alfred F., Philadelphia.
Wirt Co., Germantown, Pa. "Dielite."
Benedict & Burnham Mfg. Co., Waterbury, Conn.
Baker & Co., Herman, New York. (Importers "Excello," "Superior," "A. 1, A. 1.")
Bradford, Kyle & Co., Plymouth, Mass.
Coe Brass Mfg. Co., Torrington, Conn.
Electrical Alloy Co., Morristown, N. J. "Ideal." "Calido." "Phenix." "Grade A."
Hoskins Mfg. Co., Detroit, Mich.
Hudson Wire Co., New York.
Murray Wire Co., Newark, N. J.
Nash Co., Geo., New York. "Acme."
Prosser & Son, Thomas, New York. "Krupp".
Trenton Iron Co., Trenton, N. J. "Tico".
Washburn Wire Co., Phillipsdale, R. I.
Waterbury Brass Co., Waterbury, Conn.

REVERSING CONTROLLERS FOR CRANES, ETC.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co. Cleveland, Ohio.
General Electric Co., Schenectady, N. Y.
Industrial Controller Co., Milwaukee, Wis.
Westinghouse Electric & Mfg Co., East Pittsburgh, Pa.
Allen-Bradley Co., Milwaukee, Wis.

REVOLUTION COUNTERS. See Counters, Revolution.

RHEOSTATS.
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Badt-Westburg Electric Co., Inc., Chicago.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co. Cleveland, Ohio.
Fort Wayne Electric Works, Fort Wayne, Ind.
General Electric Co., Schenectady, N. Y.
Industrial Controller Co., Milwaukee, Wis.
Sprague Electric Works, New York.
Sundh Electric Co., New York.
Universal Electric Stage Lighting Co., New York, N. Y. "Kliegl."
Ward Leonard Electric Co., Bronxville, N. Y.
Western Electric Co., New York.
Westinghouse Electric & Mfg Co., E. Pittsburgh, Pa.
Wirt Co., Philadelphia, Pa. "Diel-ite."
Allen-Bradley Co., Milwaukee, Wis.
Fairbanks-Morse Electrical Mfg Co., Indianapolis, Ind.
Hoe & Co., R., New York City.
Jewell Electric Co., Baltimore, Md.
Leonard-Bundy Elec. Co., Cleveland, O. "Multiple Unit."
Stewart, S. J., New Orleans, La
Monitor Controller Co., Baltimore, Md.
National Electric Controller Co. Chicago
Schaefer Bros., Chicago, Ill.
Union Electric Mfg. Co., Milwaukee, Wis.

RHEOSTATS, Battery Charging.
Allen-Bradley Co., Milwaukee, Wis.
Cutler-Hammer Mfg Co., Milwaukee, Wis.
Badt-Westburg Electric Co., Inc. Chicago.
General Electric Co., Schenectady, N. Y.
Industrial Controller Co., Milwaukee, Wis.
Simplex Electric Heating Co. Cambridge, Mass. "Universal".
Universal Electric Stage Lighting Co., New York. "Kliegl."
Ward Leonard Electric Co., Bronxville, N. Y.
Western Electric Co., New York
Westinghouse Electric & Mfg Co., E. Pittsburgh, Pa.
Wirt Co., Philadelphia, Pa.
Arendt Electric Controller Co. Oakland, Calif.
Bell & Howell Co., Chicago, Ill (Inductor Compensator.)
Enterprise Optical Mfg. Co., Chicago. ("Rheostat for Moving Pictures.")
Fairbanks-Morse Electrical Mfg Co., Indianapolis, Ind.
J. H. Hallberg, New York. (Economizer for Moving Picture Lamps.)
Leonard Bundy Electric Co. Cleveland, Ohio. (Battery Charging.)
Marcuson, E., New York. "Witham."
Union Electric Mfg. Co., Milwaukee, Wis.

RHEOSTATS, Cautery. See Medical Apparatus.

RHEOSTATS, Motor Controlling. (Starting and Speed Regulating.)
Allen-Bradley Co., Milwaukee Wis.
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Badt-Westburg Electric Co., Inc. Chicago.
Cutler-Hammer Mfg. Co., Milwaukee, Wis. "Schurreman."
Electric Controller & Mfg. Co. Cleveland, Ohio. "Dinkey".
Esterline Co., The, Indianapolis, Ind.
Fort Wayne Electric Works, Fort Wayne, Ind. "Compensare."
General Electric Co., Schenectady, N. Y.

Industrial Controller Co., Milwaukee, Wis.
Lincoln Electric Co., Cleveland, Ohio.
Simplex Electric Heating Co., Cambridge, Mass. "Universal".
Triumph Electric Co., Cincinnati Ohio.
Ward Leonard Electric Co., Bronxville, N. Y.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Automatic Switch Co., New York. "Whittingham".
Barkelew Electric Mfg. Co., Middletown, Ohio.
R. W. Brown, Amsterdam, N. Y.
Federal Elec. Co., North Girard, Pa.
O. H. Gensler, Webster, Pa.
Monitor Mfg. Co., Baltimore.
New York Elec. Controller Co., New York.
Reno-Rastaer Electric Co., Cincinnati, Ohio. "Reliance".
Schaefer Bros. Co., Chicago, Ill.
Traction Equipment Co., Brooklyn, N. Y.
Union Electric Mfg. Co., Milwaukee, Wis.
United Pump & Power Co., Milwaukee, Wis. ("Perry" Motor Controller.)
Wood Motor Protecting Switch Co., San Francisco, Calif.

RHEOSTATS, Stage Dimming.
Allen-Bradley Co., Milwaukee, Wis.
Galt-Westburg Electric Co., Inc., Chicago.
Campbell Electric Co., Lynn, Mass.
Cutler-Hammer Mfg. Co., Milwaukee, Wis. "Simplicity".
General Electric Co., Schenectady, N. Y.
Universal Electric Stage Lighting Co., New York, N. Y. "Kliegl."

RINGERS, Bell. See Transformers, Low Voltage. (See Bell Ringing Motors.)

RINGERS, Extension. (See Magnetos, Magneto Generators and Bells.)

RINGS, Distributing. (See Racks and Rings.)

RINGS AND HOOKS. (Insulating Bridle Rings, Insulating Hooks.)
Hubbard & Co., Pittsburgh, Pa.
Western Electric Co., New York.
M. S. Brooks & Sons, Chester, Conn.
Cameron Appliance Co., Everett Mass.
Chicago Expansion Bolt Co., Chicago, Ill.
Diamond Expansion Bolt Co., New York. ("D-X" Bridle Rings.)
H. L. Judd Co., New York (Bridle Rings.)
Pettingell-Andrews Co., Boston, Mass.
Star Expansion Bolt Co., New York.

RINGS, Pole.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
F. Bissell Co., Toledo, Ohio.
Hubbard & Co., Pittsburgh, Pa.
Western Electric Co., New York.
American Iron & Steel Mfg Co., Lebanon, Pa.
Creaghead Engrg. Co., Cincinnati, Ohio.
M. Lanz & Sons, Pittsburgh, Pa.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Strieby & Foote Co., Newark, N J

RODS, Conduit. (See Conduit Rods.)

ROLLERS, Cable Pulling.
F. Bissell Co., Toledo, Ohio.
Mathias Klein & Sons, Chicago, Ill. "Matlock".
T. J. Cope, Estate, Philadelphia, Pa.
Hallett Iron Works, Harvey, Ill.
W. N. Matthews & Bro., St. Louis, Mo.
Specialty Device Co., Cincinnati Ohio "Bierce"

ROPE COUPLINGS. (For transmission ropes.)
C. W. Hunt Co., West New Brighton, N. Y.

ROSETTES. (See Cut-outs.)

RUBBER, Molded. See Insulation.

RUBBER GLOVES. See Gloves.

RUBBER PROTECTIVE DEVICES. See also Gloves
Linemen Protector Co., Detroit, Mich.

RUBBER SPECIALTIES.
Dickinson Mfg. Co., Springfield, Mass.

RUNWAYS, Crane.
American Bridge Co., New York.

SAD IRONS. See Flat Irons.

SAL AMMONIAC. See Chemicals.

SCALES, Automatic.
Automatic Packaging Co., Buffalo.
Automatic Weighing Machine Co., Jersey City, N. J.
Avery Scale Co., North Milwaukee, Wis.
The Fairbanks Co., New York.
Pacific Auto Weighing Machine Co., Oakland, Calif.
Richardson Scale Co., New York.
Weston Engineering Co., New York.

SCARFPINS, Electric. (See Toys and Novelties.)

SCRAPERS, Wire. (See Tools, Lineman's.)

SCREWDRIVERS, Insulated Handle, Ratchet.
Benjamin Electric Mfg. Co., Chicago, Ill.
Cincinnati Tool Co., Cincinnati, Ohio. "Hargrave".
H. W. Johns-Manville Co., New York. (Insulated Handles.)
Smith & Hemenway Co., New York.
Advance Mfg. Co., Pittsburgh, Pa. "Heins".
Benjamin-Sellar Mfg. Co., Chicago.
Buffalo Specialty Co., Buffalo, N. Y. (Leather Handle.)
Henry Disston & Sons, Philadelphia, Pa.
Ducharmes & Co., Shelburne Falls, Mass.
John D. Gould, New York. "Uptodate".
North Bros. Mfg. Co., Philadelphia, Pa. ("Yankee" Ratchet.)
L. S. Starrett Co., Athol, Mass. (Pocket.)

SCREWS, Milled, Machine Screw Products.
American Screw Co., Providence, R. I.
Atlas Bolt & Screw Co., Cleveland, Ohio.
Barnes Co., Wallace, Bristol, Conn.
Central Machinery and Supplies Co., New York City.
Chicago Nut Co., Chicago.
Chicago Screw Co., Chicago, Ill.
Clark Novelty Co., Rochester, N. Y.
Elec. Welding Products Co., Cleveland, Ohio.
Hanson Bros., Plainville, Conn.
Hartford Machine Screw Co., Hartford, Conn.
Wm. H. Haskell Mfg. Co., Pawtucket, R. I.
George Q. Hill Co., Boston, Mass.
Justrite Mfg. Co., Chicago.
Estate of F. S. Miles, Philadelphia, Pa.
National Acme Mfg. Co., Cleveland, Ohio.
A. Nelson Mfg. Co., Chicago.
New Haven Machine Screw Co., New Haven, Conn.
Pittsburgh Screw & Bolt Co., Pittsburgh, Pa.
Progressive Mfg. Co., Torrington, Conn.
St. Louis Screw Co., St. Louis, Mo.

SEALING WAX. See Wax.

SEALS, Meter. For Sealing Electric Meters.
General Electric Co., Schenectady, N. Y.
Metropolitan Engineering Co., New York City.
International Seal Co., Bridgeport, Conn. (Lead.)
Peerless Seal Co., Columbus, Ohio.
Schwerdtle Stamp Co., Bridgeport, Conn.

SEARCH LIGHTS. See Projectors.

SEATS, Pole. See Platforms.

SECOND HAND MACHINERY.
Boustead Electric & Mfg. Co., Minneapolis, Minn.
C. J. & F. E. Briner, St. Louis, Mo.
Gregory Electric Co., Chicago.
Archer & Baldwin, New York.
Dusets & Son, New York, N. Y.
Arthur Jones Co., Chicago.
Asbesto-Gleam Mfg. Co., Chicago.
Macgovern & Co., New York

SEPARATORS, Steam, Steam Separators, Oil Separators, Grease Extractors.
American District Steam Co., North Tonawanda, N. Y.
Harrison Safety Boiler Works, Philadelphia, Pa. "Cochrane"
Robertson & Sons, J. L., New York, N. Y. "Hine Eliminator".

SERVICE BOXES. See Boxes, Service.

SERVICE SWITCHES. See Switches, Disconnecting.

SETS, Generating. See Engines; also Lighting Plants.

SETS, Testing. See Instruments, testing.

SHADE HOLDERS.
Arrow Electric Co., Hartford, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Faries Mfg. Co., Decatur, Ill. (Tungsten Screwless.)
General Electric Co., Schenectady, N. Y.
Harvey Hubbell, Inc., Bridgeport, Conn.
Western Electric Co., New York.
American Brass & Copper Co., New York. "Acme".
Bryant Elec. Co., Bridgeport, Conn. "New Wrinkle Emergency."
Connecticut Metal Stamping Co., New Haven, Conn. "Eclipse".
Crouse-Hinds Co., Syracuse, N. Y.
The Dale Co., New York.
Plume & Atwood Mfg. Co., Waterbury, Conn. "Victor".
J. E. M. Shadeholder Co., New York (Screwless).
Tregoning Electric Mfg. Co., Cleveland, Ohio. (For Tungsten Lamps.)
Universal Shade Holder Co., Shamokin, Pa. "Cruickshank".
White Mfg. Co., J. H., Brooklyn.

SHADES, Arc Lamp.
General Electric Co., Schenectady, N. Y.
Western Electric Co., New York.
Fensterer & Ruhe, New York, N. Y. (Importers.)
Gill & Co., Inc., Philadelphia, Pa.
Royal Enameling & Stamping Works, Desplaines, Ill.
Wheeler Reflector Co., Boston.

SHADES, Asbestos.
Asbesto-Gleam Mfg. Co., Chicago.

SHADES, Celluloid.
Utility Shade Co., Tenafly, N. J.

SHADES, Glass. (See Glassware.)

SHADES, Leaded or Mosaic.
Amboy Works, New York.
American Art Glass Co., Camden, N. J.
Bent Glass Novelty Co., New York.
Braunstein Bros., New York, N. Y.
Chicago Lamp & Fixture Co., Chicago, Ill.
Cleveland Window Glass & Door Co., Cleveland, Ohio.
Colonial Art Glass Co., Chicago.
Detroit Stained Glass Works, Detroit, Mich.
Flanagan & Biedenweg Co., Chicago, Ill.
Giannini & Hilgart, Chicago, Ill.
Goodwin & Kintz Co., Winsted, Conn.
Handel Co., Meriden, Conn.
Harchmann Art Glass Co., Milwaukee, Wis.
Imperial Art Glass & Lamp Works, New York, N. Y.
Kramer Bros. & Co., New York.
MacBeth-Evans Glass Co., Pittsburgh, Pa. "Iridile", "Bourbonic".
Metallic Mfg. Co., Chicago, Ill.
Mosaic Shade Co., Chicago, Ill.
Neuhauser Co., D. L., Chicago.
Northwestern Chandelier Co., Chicago, Ill.
The Opalescent Bent Glass Co., New York, N. Y.
Propp Co., M., New York, N. Y.
Peltier Glass Co., Ottawa, Ill.
Rayson & Evans Co., Chicago.
Royal Art Glass Co., New York, N. Y.
Schuler Art Glass Co., Chicago.
Stavenhagen Co. W. H., Town of Union, N. J.
Temple Art Glass Co., Chicago.
Tietgen, Falk & Co., Chicago.
Tiffany Studios, New York.
Unique Art Glass & Metal Co. Brooklyn, N. Y. "Imperial".
U. S. Art Glass Co., Hartford, Conn.
Ursom Bros., Cleveland, Ohio.
Western Art Glass Shade Works, San Francisco, Calif.
Whaley & Co., J. A., New York.

SHADES, Metallic.
Benjamin Electric Mfg. Co., Chicago, Ill.
Central Electric Co., Chicago, Ill "Maxolite".
Cutter Co., Geo., South Bend Ind.
Faries Mfg. Co., Decatur, Ill
Federal Sign System (Electric) Chicago, Ill. (Porcelain Enameled.)
Harvey Hubbell, Inc., Bridgeport, Conn.
W. R. Ostrander & Co., New York.
Pass & Seymour, Inc., Solvay N. Y.
St Louis Brass Mfg. Co., St Louis, Mo.
A-A Electric Mfg. Co., Bridgeport, Conn.
Adams-Bagnall Electric Co., Cleveland, O. "Abolite".
American Reflector & Ltg. Co., Chicago, Ill. "Tungsten," Window Reflector, "Paragon."
Baltimore Enamel & Novelty Co., Baltimore, Md.
Edward E. Cary Co., New York (Importers "Prima".)
Chicago Lamp & Fixture Co., Chicago, Ill.
Consolidated Sheet Metal Works Milwaukee, Wis.
The Dale Co., New York.
Gall-Webb Mfg. Co., Buffalo
Hatton, L. D., New York, N Y (Steel Enameled.)
Herwig Art Lamp Shade Co. Chicago.
Klemm & Co., Philadelphia, Pa
Morse, Frank W., Boston, Mass "Ideal".
Overbagh & Ayres Mfg. Co., Chicago, Ill. "Oamco".
Philadelphia Elec. & Mfg. Co., Philadelphia, Pa.
Royal Enameling & Stamping Works, Desplaines, Ill.
Tea Tray Co., Newark, N. J
Vogel & Bros., W., Brooklyn
Weeks, Nelson, New York.
Western Reflector Co., Chicago, Ill.
Wheeler Reflector Co., Boston Mass. "Para-Steel".

SHADES, MIRROR. See Reflectors, Mirror.

SHADES, Paper.
Block & Co., L. D., New York
Mayer & Co., Willy, New York
Straus-Hohenstein Co., New York, N. Y.
Utility Shade Co., Tenafly, N. J.
Whaley & Co., J. A., New York.

SHADES, Reed.
Chicago Reed Ware Mfg. Co., Chicago.

SHADES, SILK.
Lynch Co., Geo. C., New York.
Straus-Hohenstein Co., New York N. Y.
Unique Art Glass & Metal Co., Brooklyn, N. Y.
Whaley & Co., J. A., New York

SHADES, Street. See Street Lighting Fixtures.

SHAFTS, Flexible.
P R Mfg. Co., Detroit, Mich.
Chicago Flexible Shaft Co., Chicago, Ill.
Coates Clipper Mfg. Co., Worcester, Mass.
Gem Mfg. Co., Pittsburgh, Pa
Stow Flexible Shaft Co., Philadelphia, Pa.
Stow Mfg. Co., Binghamton, N. Y

SHAFT STRAIGHTENERS.
Brightman Mfg. Co., Shelby, O
Columbia Machine Works & Malleable Iron Co., Brooklyn
Fitchburg Machine Works Fitchburg, Mass.
New Haven Mfg. Co., New Haven, Conn.
Niles-Bement-Pond Co., New York.
Philadelphia Roll & Machine Co., Philadelphia, Pa.
Putman Machine Co., Fitchburg, Mass.
Watson-Stillman Co., New York

SHEDS, Coal Storage.
American Bridge Co. New York
Fairbanks, Morse & Co., Chicago.

SHEDS, Train.
American Bridge Co., New York.

SHEETS, Iron and Steel. (See Metal, Electrical Sheets.)

SHELLS, Chandelier. See Spinnings.

SHIELDS, Linemen's Protecting.
Linemen Protector Co., Detroit, Mich.

SHOE AND LEATHER MACHINERY. (Motor Driven.)
American Electrical Heater Co., Detroit, Mich. (Polishing Irons.)
Boston Last Co., Boston, Mass. ("Peerless Electric Heating and Ironing Outfits.)
Champion Shoe Machinery Co., St. Louis, Mo. (Shoe Repair Outfits.)
Freeman Co., L. G., Cincinnati Ohio (Tip Repairers.)
S. M. Supplies Co., Boston, Mass (Marking Machines.)

SHOE DRIERS.
Hamilton-Beach Mfg. Co., Racine, Wis. "Cyclone".
Sanax Co., Inc., New York "Foen."

SHOE POLISHERS. See Polishers, Shoe.

SHOW CASE FIXTURES. See Fixtures, Show Case.

SIGNALING DEVICES, Automatic.
Autocall Co., The, Shelby, Ohio.
Electro-Call Signal Co., Cleveland, Ohio.
General Electric Co., Schenectady, N. Y.
Multi Signal Co., Boston, Mass.

SIGNALS, Electric Railway.
Blake Signal & Mfg. Co., Boston, Mass.
General Electric Co., Schenectady, N. Y.
Allen Electric Co., Chicago.
American Signal Co., Kansas City, Mo. "Born."
Automatic Signal & Appliance Co., Cleveland, O.
Automatic Train Stop Co., New York.
Beck Automatic Elec. Safety & Signal Switch Co., St. Louis, Mo.
Bossert Mfg. Co., W. F., Utica, N. Y.
Brach Supply Co., L. S., New York. (Crossing Belts.)
Dispatching Signal Co., Fall River, Mass. "Dispatchagraph."
Electric Automatic Railway Safety Signal Co., New York. "Lacroix."
Eureka Automatic Electric Signal Co., Tamaqua, Pa.
Federal Signal Co., Albany, N. Y.
General Railway Signal Co., Rochester, N. Y. "Standard," "Young."
Gill-Alexandar Electric Co., Denver.
Hall Ry. Signal Co., New York.
Jordan Automatic Signal Co., New York.
Kinsman Block System Co., New York.
Lintern Car Signal Co., Cleveland, O.
Los Angeles Switch & Signal Co., Los Angeles, Cal.
McFell Electric Co., Chicago.
McGlintock Mfg. Co., St. Paul, Minn.
National Elec'l Mfg. Co., Elgin, Ill.
Northey & Plummer, Indianapolis, Ind. "Simmen."
Painter, G. F., Baltimore, Md.
Richmond Co., Oshkosh, Wis.
Sandwich Electric Co., Sandwich, Ill. "National."
Stromberg - Carlson Telephone Mfg. Co., Rochester, N. Y.
Telegraph Signal Co., Rochester, N. Y.
Union Switch & Signal Co., Swissvale, Pa. "Johnson's," "National."
United States Electric Signal Co., West Newton, Mass. "Ruddick."
Williamson & Co., Allegheny, Pa. "Ramsey."
Wood Co., Chas. N., Boston, Mass. "Chapman."

SIGNALS, Elevator.
Burdett-Rowntree Mfg. Co., Chicago, Ill.
Elevator Supply & Repair Co., Chicago, Ill.
Holtzer-Cabot Electric Co., Brookline, Mass.
McFell Electric Co., Chicago.
Novelty Electric Co., Philadelphia, Pa.

SIDEWALK SIGN PROJECTORS. See Projectors, Sign.
Bryant Elec. Co., Bridgeport, Conn.

SIGNALS, Nurse.
Crockett Co., W. P., Chicago, Ill.
Electric Goods Mfg. Co., Canton, Mass.
Holtzer - Cabot Electric Co., Brookline, Mass. (Semaphore.)

SIGNALS, Marine.
Cory & Sons, Charles, New York, N. Y.

SIGN FLASHERS. See Flashers, Sign.

SIGN LETTERS, Porcelain.
Colonial Sign & Insulator Co., Akron, Ohio.
Deschere & Co., Harvey, New York. (Miniature.)

SIGN LIGHTING REFLECTORS.
Reynolds Electric Flasher Mfg. Co., Chicago, Ill.

SIGNS, Electric.
Chicago Glass Novelty Co., Marion, Ind.
Deschere & Co., Harvey, New York, N. Y.
Federal Sign System (Electric), Chicago, Ill. "Win-do-Lite."
Northwestern Electric Works, Minneapolis, Minn.
Reynolds Electric Flasher Mfg. Co., Chicago, Ill.
Universal Elec. Stage Ltg. Co., New York. "Kliegel Bros."
A-A Electric Mfg. Co., Bridgeport, Conn.
A. & W. Electric Sign Co., Cleveland, Ohio.
Advertising Mirrorgraph Co., Brooklyn, N. Y.
American Sign Co., Inc., Kalamazoo, Mich. "American Lena."
American Sign Co., Portland, Ore.
Babcock & Storm, Chicago, Ill.
Betts & Betts Corporation, New York. "New York Flashers".
Century Adv. & Mfg. Co., Lancaster, Pa.
Consolidated Elec. Sign Co., Chicago, Ill.
Cusack Co., T., Chicago, Ill.
Deschere & Co., Harvey, New York. (Argus Miniature.)
Electric Carriage Call & Specialty Co., New York, N. Y. (Universal Monogram Signs.)
Electric Mfg. Co., New Orleans.
Electrical Products Corporation, Los Angeles, Cal.
Flexlume Sign Co., Inc., Buffalo, N. Y.
Greenwood Advertising Co., Knoxville, Tenn.
Gude Co., O. J., New York City.
Haller Sign Works, Chicago, Ill. "Luna".
Halpern Bros., New York, N. Y.
Jewell Elec. Sign Co., Erie, Pa.
Kelley & Kelley, Brooklyn, N. Y.
Kohen Barbers' Supply Co., St. Louis, Mo.
National Elec. Sign Co., Jersey City, N. J.
Phelps Mfg. Co., Detroit, Mich. "New-Est," "Phelps."
Rice, Geo. H., Brooklyn, N. Y.
Strauss & Co., New York, N. Y.
Valentine Elec. Sign Co., Atlantic City, N. J.

SILK, Insulating. See Yarn and Thread.

SLATE.
Davis Slate & Mfg. Co., Chicago, Ill.
Durick, Keenan & Co., Fair Haven, Vt.
McNamara Bros., Fair Haven, Vt.
Penrhyn Slate Co., Hydeville, Vt.
Portland-Monson Slate Co., Portland, Me.

SLEEVINGS, Woven.
Belden Mfg. Co., Chicago, Ill.
Chicago Mica Co., Valparaiso, Ind.
Standard Underground Cable Co., Pittsburgh, Pa.
Hope Webbing Co., Providence, R. I.

SLEEVES, Copper Connection.
Metropolitan Engineering Co., Brooklyn, N. Y.

SLEEVES, Paper.
Standard Underground Cable Co., Pittsburgh, Pa.
Fairpont Corp., New Bedford, Mass.
Reliable Electric Co., Chicago.
Sherwin, Geo. D., Burlington, Vt. (Bushings.)
Stone Straw Co., Washington, D. C.

SLEEVES, Pole Repair.
Pittsburg Reinforced Pole Co., Pittsburgh, Pa. (Reinforcing Wooden Poles.)
Railway Track Work Co., Philadelphia, Pa.

SLEEVES AND HEADS. See Potheads.

SLEEVING AND TAPE, Cotton.
Johns-Manville Co., H. W., New York, N. Y. (Asbestos.)
Tubular Woven Fabric Co., Pawtucket, R. I.
Anchor Webbing Co., Woonsocket, R. I.
Dunton Co., M. W., Providence, R. I.
Hope Webbing Co., Pawtucket, R. I.
Neidner's Sons Co., C., Malden, Mass.
Rosendale-Reddaway Belting & Hose Co., Newark, N. J.
Textile Tube Co., Fall River, Mass.

SLOTTING MACHINES. See Machines.

SOAPSTONE, Switchboard.
Alberene Stone Co., New York.
Old Dominion Soapstone Corporation, Egmont, Va.
Williams & Co., Nashua, N. H.

SOCKETS, REGULATING
Wirt Mfg. Co., Burrage, Mass. ("Wirt.")
Electrical Auxiliaries Co., Chicago, Ill. "Eaco Turnio Reducer."

SOCKETS AND RECEPTACLES, Automobile Lamp.
Chicago Electric Mfg. Co., Chicago.
Culver-Stearns Mfg. Co., Worcester, Mass.
Frank W. Morse, Boston, Mass.
Phelps Mfg. Co., Detroit, Mich.

SOCKETS AND RECEPTACLES, Miniature and Candelabra.
Arrow Electric Co., Hartford, Conn. "Arrow E."
General Electric Co., Schenectady, N. Y.
Harvey Hubbell, Inc., Bridgeport, Conn.
Pass & Seymour, Inc., Solvay, N. Y.
Bryant Electric Co., Bridgeport, Conn.
Electric Mfg. Co., Baltimore.
Electro Importing Co., New York. (Importers.)
Franco-American Electric Novelty Co., New York, N. Y.
Industrial Novelty Co., Chicago, Ill. (Importers.)
McCandless & Co., H. W., New York, N. Y.
Mitchell-Vance Co., New York.
Vosburgh Miniature Lamp Co., West Orange, N. J.
John J. Waldman, New York.

SOCKETS AND RECEPTACLES, Standard Brass, Pull Chain, Porcelain, Waterproof Weatherproof, Dimming, Series.
Arrow Electric Co., Hartford, Conn. "Arrow E."
Benjamin Electric Mfg. Co., Chicago, Ill. "Benco".
Best Electric Co., Pittsburgh, Pa.
Central Electric Co., Chicago, Ill.
Cutler-Hammer Mfg. Co., Milwaukee, Wis. (Push Button.)
Dickinson Mfg. Co., Springfield, Mass.
Electric Appliance Co., Chicago. "Eaco Watight."
Faries Mfg. Co., Decatur, Ill.
Federal Sign System (Electric), Chicago.
General Electric Co., Schenectady, N. Y. "Multi-Catch".
National Metal Molding Co., Pittsburgh, Pa.
Ostrander & Co., W. R., New York.
Paiste Co., H. T., Philadelphia, Pa.
Pass & Seymour, Inc., Solvay, N. Y. "Passmour", "Flute."
Stanley & Patterson, New York City. "Newcode."
Trumbull Elec. Mfg. Co., Plainville, Conn. "Circle T."
Union Electric Co., Trenton, N. J.
Universal Elec. Stage Lighting Co., New York City. "Kliegl."
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wirt Co., Germantown, Philadelphia, Pa. "Dimalite."
Appleton Elec. Co., Chicago, Ill.
Bryant Electric Co., Bridgeport, Conn. "Bragdon," "New Wrinkle."
Cole & Co., Henry, Boston, Mass. "Cole."
Connecticut Electric Mfg. Co., Bridgeport, Conn. (Porcelain and rubber shell only.)
Crouse-Hinds Co., Syracuse, N. Y. "Norbitt."
Freeman Electric Co., E. H. Trenton, N. J. "Russell".
Hubbell, Inc., Harvey, Bridgeport, Conn. (Pull Sockets.)
Lovering Co., C. P., East Cambridge, Mass.
Mechanical & Electrical Mfg. Co., Chicago, Ill. "Memco."
Newgard & Co., Henry, Chicago, Ill. "Newgard."
Perkins Elec. Switch Mfg. Co., Bridgeport, Conn.
Peru Elec. Mfg. Co., Peru, Ind. "Peru."
Tregoning Electric Mfg. Co., Cleveland, Ohio. (Cleat Receptacles.)
Weber Electric Co., Schenectady, N. Y. ("Weber" Wall Sockets.)
Wirt Mfg. Co., Burrage, Mass.
Yost Electric Mfg. Co., Toledo, O.

SOCKETS AND RECEPTACLES, Special.
Anderson Mfg. Co., Albert & J. M., Boston, Mass.
Arrow Electric Co., Hartford, Conn. "Arrow E."
Central Electric Co., Chicago, Ill.
Chelten Electric Co., Philadelphia, Pa. "Chelten."
Cutler-Hammer Mfg. Co., Milwaukee, Wis. "C-H."
Federal Sign System (Electric), Chicago, Ill. "Federal."
General Electric Co., Schenectady, N. Y.
Hart Mfg. Co., Hartford, Conn. "Diamond H."
Hubbell, Inc., Harvey, Bridgeport, Conn.
Johns-Manville Co., H. W., New York, N. Y. (Molded Mica Waterproof.)
Manhattan Electrical Supply Co., New York City. "Mesco."
National Metal Molding Co., Pittsburgh, Pa. "National."
Peru Electric Co., Peru, Ind.
Stanley & Patterson, New York City.
Simplex Electric Heating Co., Cambridge, Mass. "Simplex."
Trumbull Electric Mfg. Co., Plainville, Conn. "Circle T" (Weatherproof).
Union Electric Co., Trenton, N. J.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. (Flashing Sockets.)
Wirt Co., Philadelphia, Pa ("Dim-a-lite" Regulating.)
Adams-Bagnall Electric Co., Cleveland, Ohio. ("Abolite" Shades and Sockets.)
American Electrical Heater Co Detroit, Mich.
Bryant Elec. Co., Bridgeport Conn.
Chase-Shawmut Co., Newburyport, Mass.
Conlon Elec. Co., New York City. ("Conlon Valve-Closed Watertight.")
Connecticut Elec. Mfg. Co., Bridgeport, Conn. "C. E. M. Co."
Crouse-Hinds Co., Syracuse, N. Y.
Freeman Elec. Co., E. H., Trenton, N. J.
Hart & Hegeman Mfg. Co., Hartford, Conn. "H. & H."
Lovell & Co., F. H., Arlington, N. J. "Double Eagle."
Machen & Mayer Elec'l Mfg. Co., Philadelphia, Pa. "M. & M."
Metropolitan Elec. Mfg. Co., Long Island City, N. Y.
Perkins Elec. Switch Mfg. Co., Bridgeport, Conn. "Perkins."
Russell & Stoll Co., New York City. "Russell," "R. & S. Co."
Siemon Hard Rubber Corporation, Bridgeport, Conn. (Waterproof.)
Yost Electric Mfg. Co., Toledo, Ohio.

SOCKETS, Locking.
Arrow Electric Co., Hartford, Conn.
Best Electric Co., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Pass & Seymour, Inc., Solvay, N. Y. "Shurlok."
Rall, Frederick, New York, N. Y.

SOCKETS, Magnetic.
Federal Sign System (Electric), Chicago, Ill. (Magnetic Clamp.)
Aurora Electric Co., Aurora, Ind. (Electro-Magnetic.)
Stiles & Co., H. A., Boston, Mass. ("Collom" Magnetic Lamp Holder.)

SOCKETS, Sign. (See Receptacles, Sign.)

SOCKET ADAPTERS. See Adapters, Lamp.

SOCKET ATTACHMENTS. See Attachments.

SOCKET EXTENSIONS. See Extensions, Socket.

SOCKET HANDLES. See Handles, Socket.

SOCKET KEYS. See Insulation, Molded.

SOCKET PULLS. See Attachments.

SOLDER, Aluminum.
Aluminum Solder & Refining Co., Oswego, N. Y. "Iluminite."
Clum & Atkinson, Rochester, N. Y.
International Solder Co., Syracuse, N. Y.
Reinhold Noflux Aluminum Solder Co., Newark, N. J.
Thwing Co., C. B., Philadelphia, Pa.
Universal Fluxine Co., Urbana, Ohio.

SOLDER, Self Fluxing.
L. B. Allen & Co., Inc., Chicago.
Belden Mfg. Co., Chicago, Ill.
Kellogg Switchboard & Supply Co., Chicago, Ill.
Western Electric Co., New York. "Hawthorn".
Chicago Solder Co., Chicago, Ill. "Kester".
The National Lead Co., New York, N. Y.

SOLDERING FLUX. See Fluxes, Soldering.

SOLDERING IRONS, Electric. Soldering Coppers, Branding Irons.
General Elec. Co., Schenectady, N. Y.
Manhattan Electrical Supply Co., New York.
Prest-O-Lite Co., Inc., Indianapolis, Ind.
Simplex Electric Heating Co., Cambridge, Mass.
Ward Leonard Electric Co., Bronxville, N. Y.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.
Acme Electric Heater Co., Detroit, Mich. (Branding Irons, Sad Irons.)
Apex Elec. Mfg. Co., Chicago, Ill. "N. D. Co."
Economy Electric Co., Brooklyn, N. Y. (Soldering, Branding.)
Mathew Lanz & Sons, Pittsburgh, Pa.
Nilson & Dillenbeck Co., Chicago, Ill. (Soldering Irons.)
Vulcan Electric Mfg. Co., Chicago.

SOLENOIDS. See Magnets, Electro.

SPARK COIL BOXES. See Boxes, Spark Coil.

SPARK COILS. See Coils.

SPARKING POINTS. See Platinum.

SPEAKING TUBES. (See Tubes, Speaking.)

SPEEDOMETERS. (See Tachometers.)

SPINNINGS. (For Fixture Parts.)
Bridgeport Brass Co., Bridgeport, Conn.
Faries Mfg. Co., Decatur, Ill.
Metropolitan Engineering Co., New York City.

American Spinning & Sheet Metal Works, Chicago.
Art Brass & Fixture Mfg. Co., McKees Rocks, Pa.
East Side Metal Spinning Co., New York, N. Y.
Gethberg Brass Works, H. & E., Jersey City, N. J.
Goshen Stamping & Brass Co., Goshen, Ind.
Manhattan Brass Co., New York.
Philadelphia Elect. Mfg. Co., Philadelphia, Pa.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rome Brass & Copper Co., Rome, N. Y.
Safety Lamp & Metal Mfg. Co., Pittsburgh, Pa.
Scovill Mfg. Co., Waterbury, Conn.
Simplex Railway Appliance Co., Hammond, Ind.
Standard Metal Spinning Co., New York, N. Y.
Virden Mfg. Co., Cleveland, Ohio. (Pendents.)
Waterbury Brass Co., Waterbury, Conn.
Weber Bros. Chicago, Ill.
J. H. White Mfg. Co., Brooklyn.

SPLICERS, Socket Chain.
Arrow Electric Co., Hartford, Conn.
McKenney & Waterbury Co., Boston, Mass. "Harrigan".

SPLICING CLAMPS.
Cincinnati Tool Co., Cincinnati, Ohio. "Hargrave".
Mathias Klein & Sons, Chicago, Ill.
Smith & Hemenway Co., New York.
Advance Mfg. Co., Pittsburgh, Pa. "Heinze".
Cronk & Carrier Mfg Co., Elmira, N. Y.
Dicke Tool Co., Downers Grove, Ill.
P. Lowentraut Mfg. Co., Newark, N. J.

SPLICING GUM. See Tape.

SPLICING JOINTS, CABLE. (See Cable Splicing Joints.)

SPRINGS.
American Platinum Works, Newark, N. J.
American Steel & Wire Co., Chicago, Ill.
Manross & Sons, F. N., Forestville, Conn.
A. B. C. Spring Co., New York.
Wallace Barnes Co., Bristol, Conn.
Cary Spring Works, New York.
Cleveland Wire Spring Co., Cleveland, Ohio.
Detroit Wire Spring Co., Detroit.
Dunbar Bros. Co., Bristol, Conn.
Farrington & Co., Mt. Vernon, N. Y.
Chas. Fischer Spring Co., New York.
Fort Pitt Spring & Mfg. Co., Pittsburgh, Pa.
Wm. D. Gibson Co., Chicago, Ill.
George A. Hepp, Newark, N. J.
M. D. Hubbard Spring Co., Pontiac, Mich.
Independent Steel & Wire Co., Chicago, Ill.
F. N. Manrose & Sons, Forestville, Conn. (Hair Springs.)
Raymond Mfg. Co., Corry, Pa.

SPROCKETS, Silent Chain.
Morse Chain Co. Ithaca, N. Y.

STACKS.
American Bridge Co., New York.

STAGE DIMMERS. See Rheostats.

STAGE LIGHTING APPARATUS.
A. & J. M. Anderson Mfg. Co., Boston, Mass.
General Electric Co., Schenectady.
H. W. Johns-Manville Co., New York, N. Y.
Sundh Electric Co., New York.
Universal Electric Stage Lighting Co., New York. "Kliegl Bros."
Chicago Stage Lighting Co., Chicago.
Overbagh & Ayres Mfg. Co., Chicago, Ill.

STAGE PLUGS AND RECEPTACLES.
Universal Elec. Stage Lighting Co., New York. "Kliegl."
General Electric Co., Schenectady.
Universal Electric Stage Lighting Co., New York. "Kliegl Bros."
Chase-Shawmut Co., Newburyport, Mass.
Electric Mfg. Co., New Orleans, La.
J. Lang Electric Co., Chicago.
Russell & Stoll Co., New York.

STAIRWAYS, Movable Electric.
Otis Elevator Co., New York.

STANDARD CELLS.
Leeds & Northrup Co., Philadelphia, Pa.
Weston Electrical Instrument Co,, Newark, N. J.

STANDS, Armature. See Machines, Armature.

STAPLE DRIVER.
McIntire & Co., Port Chester, N. Y.
L. S. Spencer's Sons, Guilford, Conn.

STAPLES AND TACKS, Plain.
American Steel & Wire Co., Chicago, Ill.
Grand Crossing Tack Co., Grand Crossing, Ill.
E. H. Titchener & Co., Binghamton, N. Y.
Wright Wire Co., Worcester, Mass.

STAPLES AND TACKS, Insulating.
Blake Signal & Mfg. Co., Boston, Mass. (Fibre Staples and Wood Knobs.)
Eureka Supply Co., Sewall, N. J.
James Goldmark Co., New York, N. Y. (Sole Selling Agents "Cross.")

STARTERS, Electric Motor. For A. C. Motors, see Auto-Starters; for D. C. Motors, see Rheostats, Motor Controlling.

STATIC MACHINES. See Medical Apparatus.

STATIONS, Coaling.
American Bridge Co., New York.
Fairbanks, Morse & Co., Chicago.

STATIONS, Elevated Railway.
American Bridge Co., New York.

STEEL, Armature. See Iron and Steel.

STEEL, Structural and Tool.
American Bridge Co., New York.
Baltimore Bridge Co., Baltimore.
Bellefontaine Bridge & Steel Co., Bellefontaine, O.
Belmont Iron Works, Philadelphia, Pa.
The Berlin Construction Co., Berlin, Conn.
Boston Bridge Works, Boston.
C. & P. Electric Works, Springfield, Mass.
Wm. Jessop & Sons, Inc., New York. "Ark."
Kenwood Bridge Co., Chicago.
King Bridge Co., Cleveland, O.
Pennsylvania Steel Co., Steelton, Pa.
Phoenix Bridge Co., Philadelphia, Pa.
Riverside Bridge Co., Martins Ferry, O.
Vierling Steel Works, Chicago.
Wisconsin Bridge & Iron Co., Milwaukee, Wis.

STEREOPTICONS.
General Electric Co., Schenectady.
Universal Electric Stage Lighting Co., New York. "Kliegl Bros."
Electric Stage Lighting Co., Chicago, Ill.
McIntosh Stereopticon Co., Chicago.
C. I. Newton, New York.
Victor Animatograph Co., Davenport, Ia.
Victor Electric Co., Chicago.

STERILIZERS, Instrument.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Simplex Electric Heating Co., Cambridge, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
American Electrical Heater Co., Detroit, Mich.
Presto Electrical Mfg. Co., San Francisco, Cal.

STERILIZERS, Water, Electric.
American Ozone Co., Niagara Falls, N. Y. "Ozosure".

STICKS, Switch.
Strieby & Foote Co., Newark, N. J.

STOCKS, DIES, REAMERS. (See Pipe Fitting Tools.)

STOKERS, Automatic.
Babcock & Wilcox Co., New York.
Westinghouse Machine Co, New York.
American Engineering Co., Philadelphia, Pa.
American Ship Windlass Co., Providence, R. I.
Underfeed Stoker Co., Chicago. "Jones".

STOKERS, Mechanical.
Babcock & Wilcox Co., New York.
Westinghouse Machine Co., Pittsburgh, Pa. "Roney".

STONES, Commutator.
Cleveland Stone Co., Cleveland, Ohio.

STOPS, Engine.
Consolidated Engine Stop Co., New York. "Corliss", "Monarch".
Thos. P. Ford Co., New York.
Locke Regulator Co., Salem, Mass.
Mortarless Engrng. Co., New York.
Strong, Carlisle & Hammond Co., Cleveland, Ohio.
Union Stop & Signal Co., Fall River, Mass. "Hart & Palmer".

STORAGE BATTERIES. See Batteries, Storage.

STOVES, Electric. See Cookers, Heaters, Fireless Cookers, Radiators.

STRAIGHTENERS, Shaft. See Shaft.

STRAIGHTENERS, Wire.
John P. Haga, Minneapolis, Minn.

STRAIN INSULATORS.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
Barnes & Kobert Mfg. Co., New Haven, Conn.
General Electric Co., Schenectady, New York.
H. W. Johns-Manville Co., New York.
Ohio Brass Co., Mansfield, Ohio.
St. Louis Malleable Iron Co., St. Louis, Mo.

STRAIN RELIEF GRIPS. See Grips.

STRAPS, Jack. See Tools, Lineman's.

STRAPS, Pipe. See Hangers and Clamps.

STREETHOODS.
Geo. Cutter Co., South Bend, Ind.
Line Material Co., South Milwaukee, Wis.
Philadelphia Elect. Mfg. Co., Philadelphia, Pa.

STREET LIGHTING FIXTURES, Incandescent.
Benjamin Electric Mfg. Co., Chicago, Ill.. "Parabolite" for Mazda Street Lamps.
Brady Electric Mfg. Co., New Britain, Conn.
Central Electric Co., Chicago, Ill.
Geo. Cutter Co., South Bend, Ind.
Delta-Star Electric Co., Chicago.
Federal Sign System (Electric), Chicago.
Fort Wayne Electric Works, Ft. Wayne, Ind.
General Electric Co., Schenectady.
Harvey Hubbell, Inc., Bridgeport, Conn.
Line Material Co., South Milwaukee, Wis.
Metropolitan Engineering Co., Brooklyn, N. Y.
Risinger Mfg. Co., East Liverpool, Ohio. ("Ni-tro-lite".)
Pittsburgh Transformer Co., Pittsburgh, Pa.
Western Electric Co., New York.
A-A Electric Mfg. Co., Bridgeport, Conn.
American Reflector & Lighting Co., Chicago.
Fletcher Mfg. Co., Dayton, Ohio.
Klemm & Co., Philadelphia, Pa.
F. H. Lovell & Co., Arlington, N. J. (Goosenecks.)
Lundin Electric & Machine Co., Boston, Mass.
Overbagh & Ayres Mfg. Co., Chicago, Ill. "Oameo".
Pettingell-Andrews Co., Boston, Mass. (Insulators only.)
Philadelphia Elec. & Mfg. Co., Philadelphia, Pa.
Risinger Mfg. Co., East Liverpool, Ohio.
H. C. Roberts Electric Supply Co., Philadelphia, Pa.
Tea Tray Co., Newark, N. J.
Walworth Mfg. Co., Boston, Mass (Goosenecks.)
Wheeler Reflector Co., Boston, Mass.

STREET LIGHTING SYSTEMS. See Transformers, Constant Potential.

STRETCHERS, Wire. See Comealongs.

STUDS, Fixture (Hickies, Stems and Studs.)
Appleton Electric Co., Chicago.
Bossert Co., Utica, N. Y.
Faries Mfg. Co., Decatur, Ill.
National Metal Molding Co., Pittsburgh, Pa.
Sprague Electric Works, New York.
Steel City Electric Co., Pittsburgh, Pa. "Star". "Fullman".
Thomas & Betts Co., New York, "T. & B."
Barlow Foundry Co., Newark, N. J.
Colgan Co., Wm. H., West Newton, Mass. "Rex".
Earhart, W. S., Denver, Colo.
Fralick & Co., S. R., Chicago. "Kwikon."
Grabler Mfg. Co., Cleveland, Ohio.
Macallen Co., The, Boston, Mass. "Adjustable Hickey."
Steel City Elec. Co., Pittsburgh, Pa. "Star."
Wilton Mfg. Co., Wrightsville, Pa.

STRUCTURES, Subway.
American Bridge Co., New York.

SUB-BASES, for Snap Switches. See Bases.

SUB-STATIONS, Outdoor.
Delta-Star Electric Co., Chicago, Ill.
Railway & Industrial Engineering Co., Greensburg, Pa.
Schweitzer & Conrad, Inc. Chicago.

SUPPLIES, Electrical.
Bissell & Co., F., Toledo, O.
Central Electric Co., Chicago.
Commonwealth Edison Co., Chicago, Ill.
Federal Sign System, (Electric), Chicago.
Illinois Electric Co., Chicago, Ill.
Manhattan Electrical Supply Co., New York.
Philadelphia Electric Co., Supply Dept., Philadelphia, Pa.
Stanley & Patterson, New York.
Western Electric Co., New York.

SUPPORTS, Cross Arms.
St. Louis Malleable Casting Co., St. Louis, Mo.
Hallett Iron Works, Harvey, Ill.

SURGICAL APPLIANCES. See Medical.

SURFACES. See Floor Cleaners and Polishers.

SWITCHBOARDS. (Switchboards and Panel Boards.)
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Anderson Mfg. Co., Albert & J. M., Boston, Mass.
Bissell Co., The, F., Toledo, Ohio.
Cutter Co., Geo., So. Bend, Ind.
Delta-Star Electric Co., Chicago.
Electric Controller & Mfg. Co., Cleveland, O.
Electrical Testing Co., Peoria, Ill.
Ft. Wayne Electric Works, Ft. Wayne, Ind.
General Electric Co., Schenectady, N. Y.
Metropolitan Engineering Co., New York City.
Paiste Co., H. T., Philadelphia, Pa. "Panelettes."
Post-Glover Elec. Co., Cincinnati, Ohio.
Sprague Elec. Works, New York City.
Starrett Electric Co., Chicago.
Trio Mfg. Co., Rock Island, Ill.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Co., Bantam, Conn.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Adam Elec. Co., Frank, St. Louis, Mo. "F. A."
A. G. Elec. & Mfg. Co., Seattle Wash.
Almstead Mfg. Co., Rochester, N. Y.
Butte Engineering & Elec. Co., San Francisco, Cal.
C. & P. Electric Works, Springfield, Mass.
California Elec. Supply Co., San Francisco, Cal.
Carstarphen Elec. Co., The, Denver, Colo.
Cleveland Switchboard Co., Cleveland, Ohio.
Commercial Switchboard Mfg. Co., Denver, Colo.
Crouse-Hinds Co., Syracuse, N. Y.
Cuthbert Electrical Mfg. Co., Chicago, Ill.
Drendell Elec'l & Mfg. Co., San Francisco, Cal.
Electrical Mfg. Co., Denver, Colo.
Electric Mfg. Co., New Orleans.
Elec., Ry. & Manufacturers' Supply Co., San Francisco, Cal.
Jupiter Switchboard Mfg. Co., San Francisco, Cal.
Krantz Mfg. Co., H., Brooklyn, N. Y. "Krantz Safety Panel."
J. Lang Electric Co., Chicago, Ill. "Lang." "McWilliams," "Universal."
Leonard-Bundy Elec. Co., Cleveland, Ohio.
McNamara Bros., Fair Haven, Vt.
Metropolitan Elec. Mfg. Co., Long Island City, New York, N. Y.
Mohawk Electric Mfg. Co., Newark, N. J.
Mutual Electric & Machine Co., Wheeling, W. Va.
Henry Newgard & Co., Chicago.
New Haven Elec. Switch Mfg. Co., The, North Haven, Conn.
Newport Electric Mfg. Co., Newport, Ky. (Schrimp Box.)
L. H. Nielsen Co., Pittsburgh, Pa. ("Nico" Panelboard.)
Nyelec Switchboard Co., New York.
Penn Electric & Mfg. Co., Irwin, Pa.
Pittsburgh Electrical & Machine Works, Pittsburgh, Pa.
Pringle Electrical Mfg. Co., The, Philadelphia, Pa.
Schaefer Bros., Chicago, Ill.
Standard Mechanical Equipment Co., Dallas, Texas.
Sterling Switchboard Co., Camden, N. J.
Superior Elec. Mfg. Co., Minneapolis, Minn. "Pike."

Tittle, H. S., San Francisco, Cal.
United Electric Apparatus Co., Boston, Mass.
Warder, Clark & Chaplin Elec. Co., Rochester, N. Y.
Western Elec. Works, Portland, Ore.
Wheeler-Green Elec. Co., Rochester, N. Y.
Worcester Electric Mfg. Co., Worcester, Mass.
Wm. Wurdack Electric Mfg. Co., St. Louis, Mo.

SWITCHBOARDS, Telephone. See Telephones.

SWITCHBOARDS, Theatre.
Adam Electric Co., Frank, St. Louis, Mo.
Trumbull Electric Mfg. Co., Plainville, Conn.
Universal Electric Stage Lighting Co., New York. "Kliegl Bros."
Crouse-Hinds Co., Syracuse, N. Y.
Electric Stage Lighting Co., Chicago, Ill.
Mutual Elec. & Mach. Co., Wheeling, W. Va.
J. S. Pennefather, New York.
Walker Electric Co., Philadelphia, Pa.

SWITCHBOARD CLEANERS. See Cleaners.

SWITCH BOXES. See Boxes, Conduit.

SWITCH STICKS. See Sticks.

SWITCHES AND CUT-OUTS, Battery.
Manhattan Electrical Supply Co., New York.
Metropolitan Engineering Co., New York City.
Ostrander & Co., W. R., New York, N. Y.
Trumbull Elec. Mfg. Co., Plainville, Conn.
American Specialty Co., Syracuse, N. Y.
Chicago Electric Mfg. Co., Chicago, Ill. "Handy".
Connecticut Electric Mfg. Co., Bridgeport, Conn.
Connecticut Tel. & Electric Mfg. Co., Meriden, Conn.
Electric Goods Mfg. Co., Canton, Mass. (Automatic Sectional.)
Holtzer - Cabot Electric Co., Brookline, Mass.
Francis Kell & Son, New York. "Anti-Wood".
Knoblock-Heideman Mfg. Co., South Bend, Ind.
Partrick, Carter & Wilkins Co., Philadelphia, Pa.
Voltamp Electric Mfg. Co., Baltimore, Md.

SWITCHES, Automobile, Push Button.
Arrow Electric Co., Hartford, Conn. "Arrow E."
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Hart Mfg. Co., Hartford, Conn. "Diamond H."
Manhattan Electrical Supply Co., New York, N. Y.
National Carbon Co., Cleveland, Ohio.
Chicago Electric Mfg. Co., Chicago, Ill. "Handy".
Hart & Hegeman Mfg. Co., Hartford, Conn. "H. & H."
Leece-Neville Co., Cleveland.
Frank W. Morse, Boston, Mass.
Northeast Electric Co., Rochester, N. Y.
Jos. F. O'Brien Co., New York.
Perkins Electric Switch Mfg. Co., Bridgeport, Conn.
Pittsfield Spark Coil Co., Dalton, Mass.

SWITCHES, Canopy.
Arrow Electric Co., Hartford, Conn.
Benjamin Electric Mfg. Co., Chicago, Ill.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Pass & Seymour, Inc., Solvay, N. Y.

SWITCHES, Ceiling.
Arrow Electric Co., Hartford, Conn.
H. Krantz Mfg. Co., Brooklyn, N. Y.
Charles W. Leveridge, New York "L. & L."
P. Sorensen, Brooklyn, N. Y.
Tirrill Mfg. Co., Athens, Pa.
John J. Waldman, New York "Jones-Perfection".

SWITCHES, Combination Cut-Out.
Detroit Fuse & Mfg. Co., Detroit, Mich.
D & W Fuse Co., Providence, R. I.
General Electric Co., Schenectady, N. Y.
H. W. Johns-Manville Co., New York.
Metropolitan Engineering Co., New York City.
National Metal Molding Co., Pittsburgh, Pa.
Paiste Co., H. T., Philadelphia, Pa.
Palmer Elec. & Mfg. Co., Boston, Mass.
Trumbull Electric Mfg. Co., Plainville, Conn.
Barkelew Electric Mfg. Co., Middletown, Ohio. "Star."
Bryant Electric Co., Bridgeport, Conn.
Connecticut Electric Mfg. Co., Bridgeport, Conn. "C. E. M. Co."
Freeman Elec. Co., E. H., Trenton, N. J.
Gold Car Heating & Lighting Co., New York City.
Heinemann & Co., Geo. Philadelphia, Pa.
Johns-Pratt Co., Hartford, Conn. "Noark."
W. N. Matthews & Bro., St. Louis, Mo.
Perkins Electric Switch Mfg. Co., Bridgeport, Conn.
Worcester Electric Mfg. Co., Worcester, Mass.

SWITCHES, Disconnecting.
Allis - Chalmers Manufacturing Co., Milwaukee, Wis.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
D & W Fuse Co., Providence, R. I.
Delta-Star Electric Co., Chicago.
Detroit Fuse & Mfg. Co., Detroit, Mich. (Fuse Switch Boxes.)
Electric Controller & Mfg. Co., Cleveland, Ohio.
Electrical Engineers Equipment Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
General Devices & Fittings Co., Chicago, Ill.
H. W. Johns-Manville Co., New York. "Noark".
Railway & Industrial Engineering Co., Pittsburgh, Pa. "Burke".
Schweitzer & Conrad, Inc. Chicago.
Trumbull Electric Mfg. Co., Plainville, Conn.
Bowie Switch Co., San Francisco, Cal.
Condit Elec'l Mfg. Co., Boston, Mass.
Cuthbert Electric Mfg. Co., Chicago, Ill.
Empire Electric Mfg. Co., Plainville, Conn.
G. & W. Electric Specialty Co., Chicago, Ill.
Hickey & Schneider, New York, N. Y.
Kalenborn Pahl & Francis, San Francisco, Cal.
Kelman Elec. & Mfg. Co., Los Angeles, Cal.
Lord Mfg. Co., New York.
W. N. Matthews & Bro., St. Louis, Mo.
Pacific Elec. & Mfg. Co., San Francisco, Cal.
States Electric Co., Chicago, Ill.
Walker Electric Co., Philadelphia, Pa.
Worcester Electric & Mfg. Co., Worcester, Mass.

SWITCHES, Door. See Door Switches.

SWITCHES, Fixture.
Arrow Electric Co., Hartford, Conn.
Benjamin Electric Mfg. Co., Chicago, Ill.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Harvey Hubbell, Inc., Bridgeport, Conn.
Pass & Seymour, Inc., Solvay, N. Y.
Bryant Electric Co., Bridgeport, Conn.
E. F. Caldwell & Co., New York.
Perkins Electric Switch Mfg. Co., Bridgeport, Conn.

SWITCHES, Gas Engine, Ignition.
Arrow Electric Co., Hartford, Conn.
Manhattan Electric Supply Co., New York.
Trumbull Electric Mfg. Co., Plainville, Conn.
Apple Electric Co., Dayton, Ohio.
Chicago Electric Mfg. Co., Chicago, Ill. "Handy".
Connecticut Telephone & Electric Co., Meriden, Conn.
Dow Mfg. Co., Braintree, Mass.
Edwards & Co., New York.
Empire Electric Mfg. Co., Plainville, Conn.
Knoblock-Heideman Mfg. Co., South Bend, Ind.
Kokomo Electric Co., Kokomo, Ind. "Kingston".
Frank W. Morse, Boston, Mass.
Motsinger Device Mfg. Co., Lafayette, Ind. "Faultless".
Pittsfield Spark Coil Co., Dalton, Mass.
C. F. Splitdorf, New York.
Witherbee Igniter Co., Springfield, Mass.

SWITCHES, Knife.
Adam Electric Co., Frank, St. Louis, Mo.
Anderson Mfg. Co., Albert & J. M., Boston, Mass. ("Hancock," "Ajax" Switches.)
Bissell Co., F., Toledo, Ohio. "Security".
Central Electric Co., Chicago, Ill. "Central H."
Columbia Metal Box Co., New York, N. Y.
Crocker-Wheeler Co., Ampere, N. J. "Remek".
Cutter Co., George, South Bend, Ind.
Delta-Star Electric Co., Chicago.
Electric Controller & Mfg. Co., Cleveland, Ohio.
Ft. Wayne Electric Works, Ft. Wayne, Ind.
General Electric Co., Schenectady.
Machen & Mayer Electrical Mfg. Co., Philadelphia, Pa. "M. & M."
Manhattan Electrical Supply Co., New York.
Paiste Co., H. T., Philadelphia, Pa.
Post-Glover Electric Co., Cincinnati, Ohio.
Trio Mfg. Co., Rock Island, Ill.
Trumbull Electric Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Co., Bantam, Conn.
Western Electric Co., New York.
Westinghouse Elec. & Mfg. Co., Pittsburgh, Pa.
A. G. Elec. & Mfg. Co., Seattle, Wash.
Almstead Mfg. Co., Rochester, N. Y.
American Elec. Switch Co., Springfield, Mass.
Barkelew Electric Mfg. Co., Middletown, Ohio. "Barkelew."
E. G. Bernard Co., Troy, N. Y.
Bryant Electric Co., Bridgeport, Conn.
Carman & Freyer, Indianapolis, Ind. "Star-Delta."
Cleveland Switchboard Co., Cleveland, Ohio.
Connecticut Electric Mfg. Co., Bridgeport, Conn.
Crouse-Hinds Co., Syracuse, N. Y. "Colonial".
Cuthbert Electrical Mfg. Co., Chicago, Ill.
Electric Mfg. Co., New Orleans.
J. Lang Electric Co., Chicago, Ill. ("Paragon", "McWilliams" and "Universal" Switches.)
H. Krantz Mfg. Co., Brooklyn, N. Y.
Leonard - Bundy Electric Co., Cleveland, O.
Metropolitan Elec. Mfg. Co., Long Island City, N. Y.
Mutual Electric & Machine Co., Wheeling, W. Va. "Bull Dog".
New Haven Electric Mfg. Co., North Haven, Conn.
Penn. Elec'l & Mfg. Co., Irwin, Pa.
Perkins Elec. Switch Mfg. Co., Bridgeport, Conn.
Pittsburgh Electrical & Mach. Works, Pittsburgh, Pa.
Sterling Switchboard Co., Camden, N. J.
Taunton - New Bedford Copper Co., Taunton, Mass. "Hill".
Troy Electrical Co., Troy, N. Y.
Troy Laundry Machinery Co., Chicago, Ill.
Walker Electric Co., Philadelphia, Pa.
Worcester Electric & Mfg. Co., Worcester, Mass.
Wm. Wurdack Elec. Mfg. Co., St. Louis, Mo.

SWITCHES, Marine. See Fixtures, Marine.

SWITCHES, Oil Break.
Allis - Chalmers Manufacturing Co., Milwaukee, Wis.
Anderson Mfg. Co., Albert & J. M., Boston, Mass.
Campbell Electric Co., Lynn, Mass.
General Electric Co., Schenectady, N. Y.
Hart Mfg. Co., Hartford, Conn.
Trio Mfg. Co., Rock Island, Ill.
Western Electric Co., New York.
Westinghouse Electric Mfg. Co.
E. Pittsburgh, Pa.
Condit Elec'l Mfg. Co., Boston, Mass. "Cushing".
High Tension Electrical Specialty Co., West Newton, Mass.

SWITCHES, Pendant.
Arrow Electric Co., Hartford, Conn. "Arrow E."
Benjamin Electric Mfg. Co., Chicago, Ill.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady.
Harvey Hubbell, Inc., Bridgeport, Conn. (Chain Pull.)
Machen & Mayer Elec'l Mfg. Co. Philadelphia, Pa. "M. & M."
Pass & Seymour, Inc., Solvay, N. Y.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Perkins Electric Switch Mfg. Co. Bridgeport, Conn.

SWITCHES, Pole Top.
Delta-Star Electric Co., Chicago Ill.
General Electric Co., Schenectady, N. Y.

SWITCHES, Remote Control.
Albert & J. M. Anderson Mfg Co., Boston, Mass.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co. Cleveland, Ohio.
General Electric Co., Schenectady.
Hart Mfg. Co., Hartford, Conn "P. M."
Palmer Electric & Mfg. Co. Boston, Mass.
Sundh Electric Co., New York.
Allen-Bradley Co., Milwaukee, Wis.
Automatic Switch Co., New York "Darrin".
Kelman Elec. & Mfg. Co., Los Angeles, Calif.
Walker Electric Co., Philadelphia, Pa.

SWITCHES, Snap, Flush, Push Button, Rotary.
Arrow Electric Co., Hartford, Conn. "Arrow E."
Cheiton Electric Co., Philadelphia, Pa.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Cutter Co., Philadelphia, Pa ("C. S." Push Button.)
General Electric Co., Schenectady
Hart Mfg. Co., Hartford, Conn "Diamond H", "Hartford".
Hubbell, Inc., Harvey, Bridgeport, Conn.
Manhattan Electrical Supply Co. New York.
National Metal Molding Co., Pittsburgh, Pa.
Newton Mfg. Co., Lynbrook, N. Y.
Pass & Seymour, Inc., Solvay, N. Y. "P. & S."
Trumbull Electric Mfg. Co., Plainville, Conn.
Union Electric Co., Trenton N. J.
Western Electric Co., New York
Bryant Electric Co., Bridgeport Conn.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Gordon Elec. & Mfg. Co., Chicago, Ill.
Hart & Hegeman Mfg. Co., Hartford, Conn. "Nutmeg", "H. & H."
Keil & Son, Francis, New York City.
H. Krantz Mfg. Co., Brooklyn, N. Y. "Krantz."
Machen & Mayer Electrical Mfg. Co., Philadelphia, Pa. ("M. & M." Push Button.)
Metropolitan Elec. Mfg. Co., Long Island City, N. Y. (Detachable Push Button.)
Perkins Electric Switch Mfg. Co. Bridgeport, Conn.
Pittsburgh Electrical & Machine Works, Pittsburgh, Pa.
Railway & Industrial Engineering Co., Pittsburgh, Pa.
Standard Elec. Mfg. Co., Chicago, Ill.
Tirrill Mfg. Co., Athens, Pa.

SWITCHES, Tank. See Tank Switches.

SWITCHES, Time Automatic.
Anderson Mfg. Co., Albert & J. M., Boston, Mass.
F. Bissell Co., Toledo, Ohio. "Security."
Campbell Electric Co., Lynn, Mass.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Fort Wayne Elec. Works, Fort Wayne, Ind.
General Electric Co., Schenectady.
Hart Mfg. Co., Hartford, Conn. "Diamond H."
Hartford Time Switch Co., New York.
Kennedy-Webster Co., Chicago, Ill. "Common Sense".
Palmer Elec. & Mfg. Co., Boston, Mass.
Sundh Elec. Co., New York City.
Manhattan Electrical Supply Co. New York. "Mesco".
McGill Mfg. Co., Valparaiso, Ind "Crescent".
Western Electric Co., New York
Westinghouse Electric & Mfg Co., East Pittsburgh, Pa.
A. & W. Electric Sign Co., Cleveland, Ohio.
Automatic Switch Co., New York City.
Betts & Betts Corporation, New York.
Central Burglar Alarm Co., Chicago, Ill. "Reliable".
Black-Woods Mfg. Co., Peoria, Ill.
Butte Engr'g & Elec. Co., San Francisco, Cal.
Chemelectric Co., The, Chicago, Ill. "Schweitzer."
Chicago Electric Time Switch Co., Chicago, Ill. "Aristo."
Chicago Safety Appliance Co., Chicago, Ill. "Shreve."
Electrical Mfg. Co., Oshkosh, Wis. "M & R."
Excess Indicator Co., Pittsburgh, Pa. ("Excess Indicator.")

Gearless Automatic Pump Co. Rock Island, Ill.
Jensen, Victor G., Chicago, Ill. "Commonsense."
Johnson Service Co., Milwaukee Wis.
Otis Elevator Co., Chicago, Ill.
Paragon Electric Co., Chicago.
Powers Regulator Co., Chicago, Ill.
Reliance Automatic Lighting Co., Racine, Wis.
Russell Mfg. Co., South Bend, Ind. "Russell."
Twinvolute Pump & Mfg. Co., New York City.
Waldman, John J., New York.

SWITCHES, Toggle.
Newton Mfg. Co., Lynbrook, N. Y.

SWITCHES, Voltmeter.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
General Electric Co., Schenectady.
Mineralac Electric Co., Chicago.
J. Lang Electric Co., Chicago.
Walker Electric Co., Philadelphia, Pa.
Worcester Elect. & Mfg. Co., Worcester, Mass.

SWIVELS.
Universal Cable Grip Co., Syracuse, N. Y. "Universal."

SYNCHRONIZERS, Recording.
Chemelectric Co., Chicago.

SYNCHROSCOPES. See Instruments, Testing.

SYRINGES. See Hydrometers.

TACHOMETERS AND TACHOGRAPHS. (Speed Indicators and Speed Recorders.)
Badt-Westburg Electric Co., Chicago.
Bristol Co., Waterbury, Conn.
Esterline Co., The, Indianapolis, Ind.
Roller-Smith Co., New York.
Weston Electrical Instrument Co., Newark, N. J.
James G. Biddle, Philadelphia, Pa.
Electric Tachometer Co., Washington D. C. "Hopkins".
Industrial Instrument Co., Foxboro, Mass.
Keystone Electrical Instrument Co., Philadelphia, Pa.
Lombard Governor Co., Ashland, Mass.
Queen-Gray Co., Philadelphia, Pa.
Reliance Electric & Engrg. Co., Cleveland, Ohio. (Speed Dials for Motors and Machinery.)
Veeder Mfg. Co., Hartford, Conn.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
Warner Instrument Co., Beloit, Wis.

TAGS, Cable.
Harvard Electric Co., Chicago.
Ridlon Co., Frank, Boston, Mass.

TANK ALARMS.
W. R. Ostrander & Co. New York. "Neu".
Stanley & Patterson, New York. "Patterson".
Sundh Electric Co., New York.
W. F. Irish Electric Co., New York. "Shamrock".
Partrick, Carter & Wilkins Co., Philadelphia, Pa.
John J. Waldman, New York.

TANK SWITCHES.
Electric Controller & Mfg. Co., Cleveland, O.
Sundh Elec. Co., New York.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Automatic Switch Co., New York.
Chicago Pump Co., Chicago, Ill.
Electrical Repair Co., New York
W. F. Irish Electric Co., New York. "Shamrock".
Jarvis Engine & Machine Works, Lansing, Mich.
Kewanee Water Supply Co., Kewanee, Ill.
Monitor Mfg. Co., Baltimore, Md.
Sanitary Pump Co., Dayton, Ohio
Twinvolute Pump & Mfg. Co. New York, N. Y.

TANKS, Oil Storage.
American Bridge Co., New York.

TANKS, Water.
American Bridge Co., New York.

TAPE, Insulating. (Splicing Gum. Friction Tape.)
American Electrical Works, Philipsdale, R. I. "Century".
Central Electric Co., Chicago, Ill.
Chicago Mica Co., Valparaiso, Ind.
Belden Mfg. Co., Chicago, Ill.
D & W Fuse Co. Providence, R. I. "Deltatape".
General Electric Co., Schenectady, N. Y. "Acme", "Paragon".
B. F. Goodrich Co., Akron, Ohio.
H. W. Johns-Manville Co., New York. "Magneto", "Fibroid", "Jomanco", "J. M." "Niagrite".
Kerite Insulated Wire & Cable Co., New York.
Marion Insulated Wire & Rubber Co., Marion Ind.
Mica Insulator Co., New York, "Linetape".
N. Y. Insulated Wire Co., New York. "Competition", "Grimshaw".
Okonite Co., The, New York. "Okonite", "Manson".
Packard Electric Co., Warren, Ohio. (Bias Cut.)
Standard Paint Co., New York. "P. & B."
Standard Underground Cable Co., Pittsburgh, Pa.
Walpole Tire & Rubber Co., Walpole, Mass. "Dryfield" "Norfolk", "Walpole", "Gold Seal", "Maschemco", "Kachouk".
Western Electric Co., New York. "Victor", "Amazon".
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Boston Woven Hose & Rubber Co., Cambridge, Mass.
Canfield Rubber Co., Bridgeport, Conn.
Clifton Mfg. Co., Jamaica Plain, Boston, Mass. "Gilt Edge," "Viskus."
Dunton Co., M. W., Providence, R. I. "Black Diamond".
Goshen Rubber Works, Goshen, Ind.
Hope Webbing Co., Providence, R. I. (Unsaturated Woven Tapes.)
Knowles, C. S., Boston, Mass. "Tenax", "Sampson".
Mechanical Rubber Co., Cleveland, Ohio.
Morgan & Wright, Detroit, Mich.
Pennsylvania Rubber Co., Jeannette, Pa.
Philadelphia Elect. Mfg. Co., Philadelphia, Pa.
Revere Rubber Co., Boston, Mass. "V. Z."
Schoonmaker Co., A. O., New York. (Oiled Muslin.)
St. Louis Rubber Cement Co., St. Louis, Mo.
Tingue, Brown & Co., New York.
U. S. Asbestos Co., Manheim, Pa. "Usaco". (Asbestos.)

TAPING MACHINES. See Covering Machines.

TAPS, Current.
Benjamin Electric Mfg. Co., Chicago, Ill. "Wizard".
General Electric Co., Schenectady, N. Y. "G. E."
Harvey Hubbell, Inc., Bridgeport, Conn. ("Hubbell.")
Jordan Bros., Inc., New York.
Manhattan Electrical Supply Co., New York. "Mesco".
Pass & Seymour, Inc., Solvay, N. Y.
Universal Electric Stage Lighting Co., New York, N. Y. "Kliegl."
Western Electric Co., New York.
Bryant Electric Co., Bridgeport, Conn.
The Dale Co., New York.
Yonkers Specialty Co., Yonkers, N. Y. "Metropolitan."

TELAUTOGRAPHS.
Gray National Telautograph Co., Chicago, Ill.

TELEGRAPH INSTRUMENTS.
Manhattan Electrical Supply Co., New York. (Portable Outfit.)
Western Electric Co., New York.
Baltimore Machine Products Co., Baltimore, Md. "Viaduct".
Chas. Brandes, New York. (Navy Receivers.)
Brooklyn Wireless & Electric Novelty Co., Brooklyn, N. Y.
J. H. Bunnell & Co., New York.
Dawson & Winger Electric Co., Chicago, Ill.
Electrical Industries Mfg. Co., New York.
Electro Importing Co., New York. (Small Outfits.)
Farr Telephone & Construction Supply Co., Chicago. "D. & L."
Foote, Pierson & Co., New York.
Holtzer-Cabot Electric Co., Brookline, Mass. (Operator's Head Receivers.)
Manufacturers and Inventors Electric Co., New York. "Morse Watch".
Mecrograph Co., Cleveland, Ohio. (Transmitters.)
Menominee Electric Mfg. Co., Menominee, Mich.
Omnigraph Mfg. Co., New York.
Partrick, Carter & Wilkins Co., Philadelphia, Pa.
Queen-Gray Co., Philadelphia, Pa.
Roentgen Mfg. Co., Philadelphia.
United States Electric Co., New York. ("Gill" Selector.)
Voltamp Elec. Mfg. Co., Baltimore, Md.

TELEPHONES AND SWITCHBOARDS.
Automatic Electric Co., Chicago, Ill.
C. & P. Electric Works, Springfield, Mass.
Central Electric Co., Chicago, Ill.
Central Telephone & Electric Co., St. Louis, Mo. "Prime."
Kellogg Switchboard & Supply Co., Chicago, Ill. "Express".
Manhattan Electrical Supply Co., New York. "Mesco".
Stanley & Patterson, New York.
Western Electric Co., New York.
Ackerman-Boland Tel Co., Chicago, Ill.
American Automatic Tel. Co., Urbana, Ohio.
American Electric Co., Chicago, Ill. "American Beauty", "Burns", "Leich", "Sampson", "Zabel".
American Tel. Co., Piqua, Ohio.
Andrae & Sons Co., J., Milwaukee, Wis.
Arnold Mfg. Co., S. G., Chicago.
Automatic Appliance Co., Boston, Mass.
B-R Elec. & Tel. Mfg. Co., Kansas City, Mo.
Baird Electric Co., Chicago, Ill. "Norstrom".
Baltimore Machine Products Co., Baltimore, Md.
Cadiz Electric Co., Cadiz, Ohio. "Crescent", "Mogul".
Century Tel. Construction Co., Buffalo, N. Y.
Chicago Telephone Supply Co., Elkhart, Ind.
Chicago Writing Machine Co., Galesburg, Ill.
Connecticut Telephone & Electric Co., Meriden, Conn.
Couch Co., S. H., Boston, Mass. "Multifone", "Modelfone".
Cracraft-Leich Elec. Co., Genoa, Ill.
Dean Electric Co., Elyria, Ohio.
DeVeau Telephone Mfg. Co., Brooklyn, N. Y.
Electric Goods Mfg. Co., Canton, Mass. "Annunciphone", "Bi-Une", "Roktokoil".
Electric Service Supplies Co., Philadelphia, Pa. ("Keystone" Railway.)
Electrical Engineering Co., Minneapolis, Minn.
Henry L. Elston, Muscoda, Wis.
Enochs Elec. Co., St. Paul, Minn.
Ericsson Mfg. Co., Buffalo, N. Y. (All Steel.)
Gari Electric Co., Akron, Ohio.
Green Tel. & Elec. Mfg. Co., Milwaukee, Wis.
Hepburn Tel. Mfg. Co., Chicago.
Hogrebe & Co., E. C., Cincinnati, Ohio.
Holtzer-Cabot Electric Co., Brookline, Mass.
Independent Tel. Mfg. Co., Madison, Wis.
Interstate Elec. & Mfg. Co., Sioux City, Ia.
Johnson Mfg. Co., Philadelphia.
Kokomo Tel. & Elec. Mfg. Co., Kokomo, Ind.
Lafayette Electric & Mfg. Co., Lafayette, Ind.
Loeffler, Louis J., New York.
Long Distance Tel. Mfg. Co., South Bend, Ind.
Menominee Electric Mfg. Co., Menominee, Mich.
Modern Electric Co., Burlington, Iowa. "Burlington".
Monarch Tel. Mfg. Co., Chicago.
National Elec. Works, Whittier, Cal. "Incitophone".
The National Dictograph Co., Jamaica, N. Y. (Dictograph.)
National Telegraphone Co., Rochester, N. Y. ("Telegraphone" for Telegraph Wires.)
North Electric Co., Cleveland, Ohio. ("Clement" Automanual.)
Novelty Electric Co., Philadelphia, Pa.
Partrick, Carter & Wilkins Co., Philadelphia, Pa.
Premier Electric Co., Chicago, Ill.
Regal Tel. & Mfg. Co., Saginaw, Mich.
Reliance Tel. & Mfg. Co., Butler, Pa.
Richmond Co., Oshkosh, Wis.
Homer Roberts Tel. Co., Chicago
Russell Electric Co., Danbury, Conn.
Signalphone Alarm Co., Milwaukee, Wis.
Simplex Interior Tel. Co., Cincinnati, Ohio.
Simplex Telephone & Equipment Co., Pittsburgh, Pa. (Pocket.)
Sioux City Brass Works, Sioux City, Iowa.
Spencer Electrical Co., New York.
Standard Mfg. Co., Bridgeport, Conn. "Crown".
Standard Tel. Mfg. Co., Portsmouth, Ohio.
Stoddard Tel. Construction Co. Monroe, Mich.
Stromberg - Carlson Telephone Mfg. Co., Rochester, N. Y.
Utica Fire Alarm Teleg. Co. Utica, N. Y.
Vulcan Mfg. Co., Chicago, Ill (Intercommunicating.) "Me Wade".
Western Tel. Mfg. Co., Chicago Ill. "Ideal", "Economist"
Wilhelm Tel Mfg Co., Buffalo
Williams Tel & Supply Co Cleveland, Ohio.

TELEPHONE ATTACHMENTS
Western Electric Co., New York
Electric Goods Mfg. Co., Canton, Mass. Duplphone".

TELEPHONES, Automatic.
American Automatic Telephone Co., Urbana, O.
Automatic Electric Co., Chicago

TELEPHONE DESK ARMS. See Brackets.

TEMPERATURE REGULATORS. See Regulators.

TERMINALS, Automobile, Primary, Secondary.
Metropolitan Engineering Co., Brooklyn, N. Y.
Chicago Electric Mfg. Co., Chicago.
Cook, Frank B., Chicago.
Morse, Frank W., Boston, Mass
H. B. Sherman Mfg. Co., Battle Creek, Mich.

TERMINALS, Fuse. See Fuses.

TERMINALS, Telephone Cable. See also Potheads.
Bissell Co., F., Toledo, Ohio. "Security"
Central Telephone & Electric Co., St. Louis, Mo.
Standard Underground Cable Co., Pittsburgh, Pa. "Davis".
Western Electric Co., New York
Central Machinery and Supplies Co., New York City.
Cook, Frank B., Chicago.
Fairmount Electric & Mfg. Co. Philadelphia, Pa.
Harvard Electric Co., Chicago.
La Fayette Elec. & Mfg. Co., La Fayette, Ind.
Moon Mfg. Co., Chicago, Ill
H. B. Sherman Mfg. Co., Battle Creek, Mich.
Southern Ind. Electric Co., New Albany, Ind.

TERMINALS, Underground Service.
Dossert & Co., New York.
Philadelphia Electrical & Mfg Co., Philadelphia, Pa.

TERMINALS, Wire. See Connectors, Battery, also see Lugs.

TEST CLAMPS AND CONNECTORS.
Appleton Electric Co., Chicago.
Belden Mfg. Co., Chicago, Ill.
Fairmount Electric & Mfg. Co., Philadelphia, Pa. "H. H. W."
Hubbard & Co., Pittsburgh, Pa.
Aurora Cable Clip Co., Aurora Ill.
Chicago Electric Mfg. Co., Chicago
Chicago Nut Co., Chicago.
Cutter, Scott C., Oswego, Ill.
Fahnestock Elec. Co., Brooklyn
Frankel Display Fixture Co., New York.
Hallett Iron Works, Harvey, Ill.
Harvard Electric Co., Chicago, Ill.
B. F. Kieruiff, Jr., & Co., Los Angeles, Calif. "Wardman".
Morse, Frank W., Boston, Mass "Eureka."
R. S. Mueller & Co., Cleveland Ohio. ("Universal" Insulated.)
Nagel-Chase Mfg. Co., Chicago Ill. "N. C."
P. & M. Co., Chicago, Ill.
Williams Test Clamp Co., Cleveland, Ohio.
Yonkers Specialty Co., Yonkers N. Y. "Metropolitan".

TESTERS, Fuse.
Electric Specialty Co., Cresco Iowa. "Addie".
United Electric Apparatus Co., Boston, Mass.

TESTING INSTRUMENTS. See Instruments, Testing.

TESTING LABORATORIES.
Electrical Testing Co., Peoria, Ill.
Electrical Testing Laboratories New York, N. Y.
National Electrical Laboratories New York, N. Y.
Philadelphia Meter Improvement Co Philadelphia, Pa

THEATRE APPLIANCES.
Cutter Co., Geo., South Bend, Ind. ("Cutter" Stage Receptacle and Plug.)
Sprague Electric Works, New York City.
Stanley & Patterson, New York City.
Universal Elec. Stage Lighting Co., New York City.
American Reflector & Lighting Co., Chicago, Ill.
Chase-Shawmut Co., Newburyport, Mass.
Electric Mfg. Co., New Orleans, La.
Huelsman & Moore, Cincinnati, Ohio.
Kansas City Scenic Co., Kansas City, Mo.
Krantz Mfg. Co., H., Brooklyn, N. Y.
Lang Elec. Co., J., Chicago, Ill.
Overbagh & Ayres Mfg. Co., Chicago, Ill.
Russell & Stoll Co., New York City

THEATRE DIMMERS. See Rheostats, Stage Dimming

THERMOMETERS, Electric.
Bristol Company, Waterbury, Conn.
Leeds & Northrup Co., Philadelphia, Pa.

Keystone Electrical Instrument Co., Philadelphia, Pa.
Queen-Gray Co., Philadelphia, Pa.

THERMOSTATIC ALARMS. See Fire Alarms.

THERMOSTATS.
Bristol Co., Waterbury, Conn.
Manhattan Electrical Supply Co. New York.
Anderson Co., Thos. P., New York, N. Y.
Bunnell & Co., J. H., New York.
Copenhagen Automatic Fire Alarm Co., Sheboygan, Wis.
Electrical Automatic Appliance Co., Denver, Colo.
Montauk Fire Detecting Wire Co., New York, N. Y. "Quickest".
Murphy Specialty Co., Detroit, Mich.
National Clock & Electric Mfg. Co., St. Louis, Mo.
Star Electric Co., Binghamton, N. Y.
Storms, Francis, New York. (Mercurial.)
Vierkant, H. C., Tarrytown, New York.
Wall, G. A., Providence, R. I.

THREAD, Insulating. See Yarn.

TIE WIRE, Formers. See Formers.

TIES, Pressed Steel.
American Bridge Co., New York.

TIME STAMPS.
Calculagraph Co., New York.
Baird Electric Co., Chicago.
Ellis Time Stamp Co., Chicago.
Industrial Instrument Co., Foxboro, Mass.
Sohm Electric Signal and Recording Co., Chicago.

TIME SWITCHES. See Switches, Time.

TIMERS, Ignition.
Beckley-Ralston Co., Chicago, Ill. "Maximus".
Benford Mfg. Co., E. M., Mt. Vernon, N. Y. "Monarch".
Duplex Coil Co., Fond du Lac, Wis.
Fulmer, C. F., Plainfield, N. J. "Invincible".
Heinze Electric Co., Lowell, Mass.
Herbert, W. H., Chicago, Ill. "Little Giant".
Kokomo Electric Co., Kokomo, Ind. "Kingston".
Lovell-McConnell Co., Newark, N. J. "Lacoste".
Uncas Specialty Co., Norwich, Conn. "Leavitt".
Waterhouse Co., Boston, Mass. "Bemis".
Witherbee Igniter Co., Springfield, Mass. "Wico"

TIPS, Cord.
Belden Mfg. Co., Chicago, Ill.
Rome Wire Co., Rome, N. Y.
McEvoy, C. H., Lowell, Mass. "Duro".
National Acme Mfg. Co., Cleveland, Ohio.
Runsel-Lens Elec. Mfg. Co., Chicago.

TOGGLE-BOLTS.
Geo. Cutter Co., South Bend, Ind. "Lever".
McGill Mfg. Co., Valparaiso, Ind. "Crescent".
Chicago Nut Co. "Ajax," Chicago.
Conian Electric Co., New York. ("Jenceco" Toggle Strap.)
P. Sorenson, Brooklyn, N. Y.
Star Expansion Bolt Co., New York.
Steward & Romaine Mfg. Co., Philadelphia, Pa.
John J. Waldman, New York, N. Y.
Thos. Wrigley Co., Chicago, Ill.

TOLL BOXES. See Meters.

TONGS, Carbon.
Billings & Spencer Co., Hartford, Conn.

TONGS, Fuse Plug.
Conrad, J. D., Columbus, Ohio.

TOOL BAGS. See Tools, Lineman's.

TOOLS, Boring, Electricians'.
Cincinnati Tool Co., Cincinnati, O.
Electric Appliance Co., Chicago, Ill. "O. K."
F R Mfg. Co., Detroit, Mich. "Anthony."
Bergman Tool Mfg. Co., Buffalo, N. Y. "Amiden".
Bowlus Mfg. Co., H. C., Springfield, Ohio.
Busch Mfg. Co., San Francisco, Calif. "Standard".
Chicago Pneumatic Tool Co., Chicago, Ill. "Duntley", "Little Giant".
Daugherty, Smith, Phillips Co., Chicago.
Ford Auger Bit Co., Holyoke, Mass. "Standard".
Fray & Co., J. S., Bridgeport, Conn.
Garretson, George, San Diego, Calif. "E & G"
Henderson Electric Co. Charlottesville, Va.
Jones Convertible Boring Machine Co., Pittsburgh, Pa.
Kyle, W. H., Akron, Ohio.
McCrea & Co., Jas., Chicago, Ill. "Zeek", "Roberts".
Mayhew Co., H. H., Shelburne Falls, Mass. "Goodell".
Millers Falls Co., New York.
North Bros. Mfg. Co., Philadelphia, Pa. "Yankee".
Powell, H. S., Utica, N. Y. (Linemen's Pole Brace.)
Rover, A. E., Binghamton, N. Y. "G. & E."
Russell Jennings Mfg. Co., Chester, Conn.
Shellman, A. J., Grand Rapids, Mich. "Signor".
Turgor Borer Co., Stapleton, S. I.

TOOLS, Cable Pulling.
American Steel & Wire Co., Chicago, Ill.
General Electric Co., Schenectady.
B. F. Goodrich Co., Akron, Ohio.
Hazard Mfg. Co., Wilkes-Barre.
Hubbard & Co., Pittsburgh, Pa.
Packard Electric Co., Warren, Ohio.
Roebling's Sons Co., John A., Trenton, N. J.
Safety Insulated Wire & Cable Co., New York.
Bishop Gutta Percha Co., New York.
Boston Insulated Wire & Cable Co., Boston, Mass.
T. J. Cope, Estate, Philadelphia, Pa.
Hallett Iron Works, Harvey, Ill.

TOOLS, Commutator Truing.
Fort Wayne Electrical Works, Ft. Wayne, Ind. "B. & B."
General Electric Co., Schenectady.
Jordan Bros., New York.
Bryant & Berry Co., Detroit, Mich.
Imperial Electric Co., Akron, Ohio. "Carr".
Phillips Mfg. Co., New York.
Railway & Industrial Engineering Co., Pittsburgh, Pa. "Burke".

TOOLS, Digging, Augers, Spoons.
Hubbard & Co., Pittsburgh, Pa.
Mathias Klein & Sons, Chicago.
Oshkosh Mfg. Co., Oshkosh, Wis.
Western Electric Co., New York.
Ames Shovel & Tool Co., N. Easton, Mass.
Beall Bros., Alton, Ill.
H. Channon Co., Chicago, Ill.
Columbus Handle & Tool Co., Columbus, Ind.
Eureka Digging Co., Chicago.
Everstick Anchor Co., St. Louis, Mo. ("Blackburne" Telescoping Auger Handles.)
Fairbanks, Morse & Co., Chicago.
Gibbs Mfg. Co., Canton, Ohio. "National", "Columbus".
Iwan Bros., South Bend, Ind. (Post Hole Augers.)
Pittsburgh Shovel Co., Pittsburgh.
Standard Earth Auger Co., Chicago, Ill.
Wyoming Shovel Works, Wyoming, Pa.

TOOLS, LINEMEN'S. See also Climbers, Pliers, Drills, Splicing Clamps.
Central Electric Co., Chicago, Ill.
Hubbard & Co., Pittsburgh, Pa.
Johnson, M. E., Chicago, Ill.
Mathias Klein & Sons, Chicago.
Oshkosh Mfg. Co., Oshkosh, Wis.
Smith & Hemenway Co., New York.
Sprague Electric Works, New York. (Conduit Cutting and Reaming.)
Western Electric Co., New York.
Berry Bros., Detroit, Mich.
Buckeye Mfg. Co., Canton, Ohio. ("Electric" Spud.)
Champion Tool & Handle Works, Evart, Mich. (Pike Poles.)
Columbus Handle & Tool Co., Columbus, Ind.
Dicke Tool Co., Downers Grove, Ill.
Electric Tool Co., Chicago. "P & G" Wire Skinner.
Hallett Iron Works, Harvey, Ill.
Handian-Buck Mfg. Co., St. Louis, Mo. "Jackson".
Fred L. Meckel, Chicago, Ill.
C. S. Osborne & Co., Newark, N. J.
Safety Armorite Conduit Co., Pittsburgh, Pa. (Armor Strippers.)
Vanderman Mfg. Co., Williamantic, Conn. (Tool Boxes and Pipe Benders.)

TOOLS, Pipe Fitting.
Borden Co., Warren, O. "Beaver" Die Stocks.

TOOLS, Portable Electric Polishers, Buffers, Drills, Grinders, Hammers.
Emerson Electric Mfg. Co., St. Louis Mo.
Fairbanks, Morse & Co., Chicago.
Fort Wayne Electric Works, Fort Wayne, Ind.
General Electric Co., Schenectady, N. Y. (Portable Breast Drill.)
Hamilton-Beach Mfg. Co., Racine, Wis. "H-B Portable".
Mechanical Appliance Co., Milwaukee, Wis. (Ajax Riveters, "Watson" Buffers and Grinders.)
Morse Twist Drill & Machine Co., New Bedford, Mass.
Orr & Lockett Hardware Co., Chicago.
Robbins & Myers Co., Springfield, Ohio.
Roth Bros. & Co., Chicago, Ill.
Sprague Electric Co., New York.
Western Electric Co., New York. ("Hawthorn" Breast Drill.)
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wisconsin Electric Co., Racine, Wis. "Dumore".
Anderson Elec. Mach. Tool Co., St. Louis, Mo.
Bodine Elec. Co., Chicago, Ill.
Caldwell & Co., J. E., Philadelphia, Pa. (Silver Cleaners.)
Chicago Expansion Bolt Co., Chicago, Il.
Chicago Pneumatic Tool Co., Chicago, Ill. ("Duntley" and "Little Giant" Drills.)
Cincinnati Electrical Tool Co., Cincinnati, O. "Peerless".
Jas. Clark, Jr., Elec. Co., Louisville, Ky.
Coates Clipper Mfg. Co., Worcester, Mass.
Thos. H. Dallett Co., Philadelphia, Pa.
Deer Co., Inc., A. J., Hornell, N. Y. ("Royal" Portable Drills.)
Dilg Mfg. & Trading Co., New York.
Electro-Magnetic Tool Co., Chicago, Ill. (Electric Percussion Drill for Stone, Brick and Concrete, also Hammers.)
Fortuna Machine Co., New York. (Importers Drills.)
Foster & Hosler, Chicago, Ill. ("Ajax" Tool for Lettering on Stone.)
Globe Electric Co., Chicago, Ill. (Buffing Lathes.)
Goshen Stamping & Brass Co., Goshen, Ind.
W. Green Electric Co., New York.
Hisey-Wolfe Machine Co., Cincinnati, O.
Holtzer-Cabot Electric Co., Brookline, Mass.
Independent Pneumatic Tool Co., Chicago.
Kelley Electric Machine Co., Buffalo, N. Y.
Lamb Elec. Co., Grand Rapids, Mich.
Leiman Bros., New York. (Combination Polishing and Dust Collecting Outfit.)
Oliver Mfg. Co., W. W., Buffalo, N. Y.
Pennsylvania Casting & Machine Co., Pittsburgh, Pa.
Standard Electric Tool Co., Cincinnati, O.
Stewart, S. J., New Orleans, La. ("Standard" Polishing Lathe.)
Stow Mfg. Co., Binghamton, N. Y. (Buffers and Polishers.)
U. S. Electric Tool Co., Cincinnati, O.
Victor Electric Co., Chicago, Ill.
Virginia Electric Tool & Mfg. Co., Petersburg, Va. ("Paulero" Electric Hammer.)
Wiley Auto & Mach. Co., Jeffersonville, Ind. "Simple".

TOOLS, Threading.
Borden Co., Warren, Ohio.

TORCHES, Alcohol.
McGill Mfg. Co., Valparaiso, Ind.
Western Electric Co., New York.
Berns, Otto, Newark, N. J. "Always Reliable".
Clayton & Lambert Mfg. Co., Detroit, Mich.
Hess & Son, Philadelphia, Pa. "Tinol".
Knapp Mfg. Co., New York. (Self-Acting.)
Osborne & Co., C. S., Newark, N. J.
Turner Brass Works, Sycamore, Ill. "Gem", "Wilson".
H. C. Roberts Elec. Supply Co., Philadelphia, Pa. "Victor", "Roberts".
Wood, Jr., C. D., New York. "Liberty".

TORCHES AND FURNACES, Gasoline.
Allen Co., L. B., Inc., Chicago, Ill.
Bridgeport Brass Co., Bridgeport, Conn. ("Queen", "Vulcan" Torches.)
McGill Mfg. Co., Valparaiso, Ind.
Prest-O-Lite Co., Inc., Indianapolis, Ind.
A. D. Mfg. Co., Detroit, Mich.
American Stove Co., St. Louis, Mo. ("Reliable" Furnace.)
Baker & Sons Co., J. R., Kendallville, Ind. (Furnaces.)
Berns, Otto, Newark, N. J. ("Always Reliable" Furnace.)
Burgess Soldering Furnace Co. Columbus, O. ("Gem" Furnace.)
Carleton Co., Boston, Mass. "Imp."
Clayton & Lambert Mfg. Co., Detroit, Mich.
Diener Mfg. Co., G. W., Chicago, Ill. "Torrid".
Globe Brass Works, Detroit, Mich. ("Diamond", "Perfection" Torches.)
Haines, Jones & Cadbury Co., Philadelphia, Pa. (Furnaces.)
Hine-Watt Mfg. Co., Chicago, Ill. ("Marion" Torch.)
Knapp Mfg. Co., New York.
Park & McKay Co., Detroit, Mich. (Furnaces.)
Quadriga Mfg. Co., Chicago, Ill. ("Walters" Torch.)
Register, Robt. A., Baltimore, Md. "Victor".
Sun Vapor Street Light Co., Canton, Ohio. (Torches.)
Turner Brass Works, Sycamore, Ill. "Kinzie", "Hot Blast", "Old Reliable", "Franklin", "Mogul, Jr.", "Jewell", "Bull Dog", "Mogul".
Volcano Torch & Mfg. Co., Erie, Pa. (Torches.)
Wall Mfg. Supply Co., Pittsburgh, Pa. "Dreadnaught."
The Wellington Mfg. Co., New York. (Torches.)
West Mfg. Co., Buffalo, N. Y. (Furnaces.)
Wolff Mfg. Co., L., Chicago, Ill. ("Duro" Furnace.)

TORCHES AND FURNACES, Kerosene.
Barnes Tool Co., New Haven, Conn. (Furnaces.)
Barthel Blow-Lamp Co., Boston, Mass. (Torches.)
McClintock & Irvine, Pittsburgh.
Mack Mfg. Co., T. A., Jersey City, N. J. ("Khotal" Furnace.)
Turner Brass Works, Sycamore, Ill. "Hot Blast".

TOWER WAGONS. See Wagons.

TOWERS, Cooling. See Cooling.

TOWERS, Electric Transmission.
American Bridge Co., New York.

TOWERS, Outdoor Sub-Stations.
Delta-Star Electric Co., Chicago.
Railway & Industrial Engineering Co., Pittsburgh, Pa.

TOWERS, Steel, Transmission.
American Bridge Co., New York.
Aermotor Co., Chicago, Ill.
Archbold-Brady Co., Syracuse, N. Y.
Fitzpatrick & Coombs, New York, N. Y.
Los Angeles Switch & Signal Co., Los Angeles, Cal.
Milliken Bros., New York
Railway & Industrial Engineering Co., Pittsburgh, Pa.
Riter-Conley Mfg. Co., Pittsburgh, Pa.
Ross Supply Co., Greenville, Ohio.

TOY MOTORS. See Meters, Battery.

TOY TRANSFORMERS. See Transformers, Low Voltage.

TOYS AND NOVELTIES.
Manhattan Electrical Supply Co., New York, "Mesco".
Rittenhouse Co., A. E., Honeoye Falls, N. Y.
Stanley & Patterson, New York. ("Matchless" Scarfpin.)
Carlisle & Finch Co., Cincinnati, Ohio.
Electro Importing Co., New York.
Franco-American Electric Novelty Co., New York.
H. K. Electric Toy Co., Indianapolis, Ind. (Toy Engine.)
Howard Miniature Lamp Co., Newark, N. J.
Industrial Novelty Co., Chicago.
Ives Mfg. Corp., Bridgeport, Conn.
Kendrick & Davis Co., Lebanon, N. H.
Knapp Elec. & Novelty Co., New York. ("Electric Questioner" and Street Railway.)
Lionel Mfg. Co., New York. ("De-Luxe" Train.)
Ohio Electric Works, Cleveland.
Leon W. Pullen Co., Philadelphia, Pa.
Rhode Island Telephone & Electric Co., Providence, R. I. (Baby Dynamos.)
Russell Elec. Co., Danbury, Conn "Mimiphone".
Standard Electric Novelty Co., Chicago, Ill.
Swedish-American Telephone Co., Chicago, Ill. (Solenoid Electric Engines.)
E. J. Tardie, New York.
Universal Novelty Co., New York. (Magic Lantern.)
Voltamp Electric Mfg. Co., Baltimore, Md.

TRANSFORMER CUT-OUTS. See Cut-Outs.

TRANSFORMERS, Constant Potential. (Tob Systems.)
Fort Wayne Electric Works, Ft. Wayne, Ind.
Meloney Electric Co., St. Louis, Mo.
General Electric Co., Schenectady.

Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.
Heltos Mfg. Co., Philadelphia, Pa.

TRANSFORMERS, High Voltage.
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Campbell Electric Co., Lynn, Mass.
Central Electric Co., Chicago, Ill.
Crocker-Wheeler Co., Ampere, N. J. "Remek".
Duncan Electric Mfg. Co., Lafayette, Ind.
Fort Wayne Elec. Works, Fort Wayne, Ind.
General Electric Co., Schenectady.
Kuhlman Electric Co., Bay City, Mich.
Moloney Electric Co., St. Louis, Mo.
Packard Electric Co., Warren, O.
Pittsburgh Transformer Co., Pittsburgh, Pa.
Triumph Electric Co., Cincinnati, Ohio.
Wagner Electric Mfg. Co., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
American Transformer Co., Newark, N. J.
Enterprise Electric Co., Warren, O. "Peerless".
Jefferson Electric Mfg. Co., Chicago.
James Jones Co., Los Angeles, Calif. "Omega".
Thordarson Elec. Mfg. Co., Chicago.
Vindex Electric Co., Aurora, Ill.

TRANSFORMERS, Low Voltage. Moving Picture, Tungsten Economizing, Wireless, Toy, Bell Ringing.
Campbell Elec. Co., Lynn, Mass. ("Lowvolt" for Tungsten Lamps.)
Central Electric Co., Chicago, Ill.
Crocker-Wheeler Co., Ampere, N. J. "Remek."
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Ft. Wayne Elec. Works, Ft. Wayne. Ind.. "Wayne."
General Electric Co., Schenectady.
Kuhlman Electric Co., Bay City, Mich.
Manhattan Electrical Supply Co., New York, N. Y. (A. C.)
Moloney Electric Co., St. Louis, Mo.
Packard Electric Co,. Warren, O.
Pittsburgh Transformer Co., Pittsburgh, Pa.
Reynolds Electric Flasher Mfg. Co., Chicago, Ill.
Rittenhouse Co., A. E., Honeoye Falls, N. Y.
Sangamo Electric Co., Springfield, Ill.
Triumph Electric Co., Cincinnati, Ohio.
Viking Elec. Co., Albany, N. Y. (Bell Ringing.)
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
American Transformer Co., Newark, N. J.
Bell, Don J., Chicago, Ill. ("Inductor Compensator.")
Bennett Co., I. A., Chicago, Ill. "No-Watt."
Butler Electric Co., David City, Nebr.
Connecticut Tel. & Elec. Co., Meriden, Conn.
Dongan Electric Co., Detroit, Mich.
Dynalectric Co., Hyde Park, Mass.
Edwards & Co., New York. "Cadet," "Dixie."
Electric Economy Co., Roxbury, Boston, Mass. "Beacon."
Electro-Surgical Inst. Co., Rochester, N. Y. (For Surgical Miniature Lamps.)
Empire Transformer Co., Chicago, Ill.
Enterprise Electric Co., Warren, O. "Peerless."
Goettmann, O. J., Pittsburgh, Pa.
Hadfield-Hall Co., Wausau, Wis. ("H. & H." for Moving Pictures.)
Hallberg, J. H., New York, N. Y. (For Moving Pictures, Tungsten Lamps.)
R. Haas Elec. & Mfg. Co., Springfield, Ill. "Adams."
Hartman Electrical Mfg. Co., Mansfield, O. (Bell ringing.)
Hoskins Mfg. Co., Detroit, Mich. (Used in connection with Ammeters and Voltmeters.)
J. & H. Reducer Co., Omaha, Neb. "J. & H."
Jefferson Electric Mfg. Co., Chicago.
Mohawk Electric Mfg. Co., Newark, N. J.
Reppel Electric Co., Kansas City, Mo. (Bell Ringing.)
Thordarson Electric Mfg. Co., Chicago, Ill.
United Electric Apparatus Co., Boston, Mass.
Vindex Elec. Co., Aurora, Ill.
Western Transformer Co., East Oakland, Cal.

TRANSMISSION, Silent Chain.
Morse Chain Co., Ithaca, N. Y.

TRANSMISSION MATERIAL.
General Electric Co., Schenectady.
H. W. Johns-Manville Co., New York, N. Y.

TREADS, Floor, Push Button.
Manhattan Electrical Supply Co., New York, N. Y.
Ansonia Electrical Co., Ansonia, Conn. "Delay."
Edwards & Co., New York, N. Y. "Dixie."
Keil & Son, Francis, New York, N. Y.
Renim Specialty Co., Brighton Station, Boston, Mass. "Ideal."

TREE INSULATORS.
Albert & J. M. Anderson Mfg. Co., Boston, Mass.
Brookfield Glass Co., New York.
Geo. Cutter Co., South Bend, Ind.
Dickinson Mfg. Co., Springfield, Mass.
High Tension Electrical Specialty Co., Newton, Mass. "Holmes."
Line Material Co., South Milwaukee, Wis.
Ohio Brass Co., Mansfield, Ohio.
Scott C. Cutter, Oswego, Ill.
Dunton & Field, Cambridge, Mass.
Mariatt, S., Richmond, Ind. "Peerless."
McKenney & Waterbury Co., Boston, Mass. "Harrigan."
W. H. Olmstead Mfg. Co., Detroit, Mich. ("Buckbee" Rotary Tree Bracket.)
Ridlon Co., Frank, Boston, Mass. "Rogers."
Wetmore-Savage Co., Boston, Mass. (Sole Selling Agents for "Kirby.")

TREE TRIMMERS.
Boyd Mfg. Co., Rockville, Ind.

TROLLEY HANGERS, Porcelain.
White Co., T. C., St. Louis, Mo.

TROLLEYS AND CHAIRS, (Cable Stringing).
F. Bissell Co., Toledo, Ohio. "Security."
Central Telephone & Electric Co., St. Louis, Mo. "Arrow."
Oshkosh Mfg. Co., Oshkosh, Wis.
Western Electric Co., New York.
W. N. Matthews & Bro., St. Louis, Mo.

TROUBLE FINDING LAMPS.
See Guards, Portable.

TRUCKS, ARMATURE.
See Machines.

TRUCKS, Electric.
See Automobiles.

TRUCKS, Elevating.
National Scale Co., Chicopee Falls, Mass.

TRUSSES, Roof.
American Bridge Co., New York.

TUBE BENDERS.
See Benders.

TUBE CLEANERS, Boiler Flue.
See Cleaners.

TUBE CUTTERS.
See Pipe Fitting Tools.

TUBES, Paper.
See Sleeves, Paper.

TUBES, Porcelain.
See Porcelain.

TUBES, Speaking.
Central Electric Co., Chicago, Ill.
Manhattan Electrical Supply Co., New York, N. Y.
Ostrander Co., W. R., New York, N. Y.
Western Electric Co., New York.
Francis Keil & Son, New York.
Poole, James W., Boston, Mass.
Vulcan Mfg. Co., Chicago, Ill. (Phone and Mail Box.) "McWade" Combination Tube.
Owen Walsh Mfg. Co., New York, N. Y.
Wilhelm, H., Brooklyn, N. Y.

TUBING, Brass and Copper.
Bridgeport Brass Co., Bridgeport, Conn.
Farles Mfg. Co., Decatur, Ill.
Benedict & Burnham Mfg. Co., Waterbury, Conn.
Coe Brass Mfg. Co., Torrington, Conn.
O. T. Hungerford Brass & Copper Co., New York, N. Y.
Elwood Ivins, Philadelphia, Pa.
New Jersey Tube Co., Harrison, N. J.
Rome Brass & Copper Co., Rome, N. Y.
Summerill Tubing Co., Philadelphia, Pa.
United Wire & Supply Co., Providence, R. I.

TUBING, Flexible Fabric.
(See also Conduit, Flexible.)
Alphaduct Co., Jersey City, N. J.
American Circular Loom Co., New York City. "Circular Loom."
American Conduit Mfg. Co., Pittsburgh, Pa.
National Metal Molding Co., Pittsburgh, Pa.
Tubular Woven Fabric Co., Pawtucket, R. I.
Chernack Mfg. Co., Pawtucket, R. I.
Conduit & Cable Mfg. Co., Chelsea, Mass. "Woven Conduit."
Eastern Flexible Conduit Co., Brooklyn, N. Y.
Saylor Elec. Co., Pittsburgh, Pa.

TUNGSTEN ADAPTERS.
See Adapters.

TUNGSTEN BOXES AND WRAPPERS.
See Boxes.

TUNGSTEN CLUSTERS.
See Clusters.

TURBINE GOVERNORS.
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Machine Company. Pittsburgh, Pa.

TURBINES, Steam.
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Machine Co., Pittsburgh, Pa. "Westinghouse-Parsons."
Ball & Wood Co., Elizabethport, N. J. "Rateau-Smoot."
E. W. Bliss Co., Brooklyn, N. Y.
DeLaval Steam Turbine Co., Trenton, N. J.
Hooven, Owens & Rentschler Co., Hamilton, O. "Hamilton-Holswarth."
Kerr Turbine Co., Wellsville, N. Y.
B. F. Sturtevant Co., Hyde Park, Mass.
Terry Steam Turbine Co., Hartford, Conn.
Wilkinson Turbine Co., Birmingham, Ala.

TURBINES, Water.
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Allentown Foundry & Machine Co., Allentown, Pa.
American Steel Dredge Works, Logansport, Ind. "Little Giant."
Baugher, Kurtz & Stewart, York, Pa. "Rechard."
Camden Water Wheel Works, Camden, N. Y.
Cassel Automatic Water Motor Co., Seattle, Wash.
Chase Turbine Mfg. Co., Orange, Mass.
Christiana Machine Co., Christiana, Pa.
Dayton Globe Iron Works, Dayton, O. "New American."
Abner Doble Co., San Francisco, Calif.
Humphrey Machine Co., Keene, N. H.
Rodney Hunt Machine Co., Orange, Mass.
Leffel & Co., James, Springfield, O. "Samson."
Norrish, Burnham & Co., Glen Rock, Pa. "Burnham."
Pelton Water Wheel Co., San Francisco, Calif. "Pelton-Francis."
Platt Iron Works Co., Dayton, O. "Victor."
Risdon-Alcott Turbine Co., Mt Holly, N. J. "Leviathan."
Robinson, A. J., Brentwood, N. H.
Smith Co., S. Morgan, York, Pa. "McCormick."
Steele Water Motor Co., Moravia, N. Y. "Helical."
Trump Mfg. Co., Springfield, O.
Turners Falls Machine Co., Turners Falls, Mass. "Crocker."
United Iron Works, Oakland, Calif. "Tuthill."
Wolf Co., Chambersburg, Pa.

UNDERGROUND INSTALLATIONS.
Freeman-Sweet Co., Chicago, Ill.
Gest, G. M., New York, N. Y.
Graner-Mahoney Contracting Co., St. Louis, Mo.
Metropolitan Engineering Co., New York City.
Standard Underground Cable Co., Pittsburgh, Pa.
J. W. Turner Improvement Co., Des Moines, Iowa.

UNITS.
See Resistance.

VACUUM CLEANERS.
Central Electric Co., Chicago, Ill.
Federal Sign System (Electric), Chicago, Ill. "Federal."
Western Electric Co., New York.
Wisconsin Electric Co., Racine, Wis. "Dumore," "Dumore, Jr."
American Radiator Co., Chicago, Ill. "Houston."
American Rotary Valve Co., Anderson, Ind. (Plant.)
American Suction Cleaner Co., New York. "Peerless."
Astle & Co., H. G., Providence, R. I. "Borland."
Atwood Vacuum Cleaner Co., Rockford, Ill.
Automatic Vacuum Cleaner Co., Bloomington, Ill.
Backus Co., Newark, N. J.
Baker, Roy C., Boston, Mass. (Cleaning Plant.)
Birtman Electric Co., Chicago, Ill. "Bee."
Clements Mfg. Co., Chicago, Ill. "Cadillac."
Connersville Blower Co., Connersville, Ind.
Cyclone Vacuum Cleaner Co., Bradford, Pa. "Champion," "Superb."
Duntley Mfg. Co., Chicago, Ill. "Standard."
Duntley Products Co., Erie, Pa.
Electric Cleaner Co., Chicago, Ill. "Reliable," "Positive."
Electric Renovator Mfg. Co., Pittsburgh, Pa. "Invincible."
Empire Vacuum Co., New York, N. Y. "Imperial."
Eureka Vacuum Cleaner Co., Detroit, Mich.
Foster & Glidden Eng'g Co., Buffalo, N. Y.
Hanlon & Wilson, Wilkinsburg, Pa. "Vak-Klean."
Hope Vacuum Cleaner Co., Kansas City, Mo. (Stationary.)
Hoover Suction Sweeper Co., New Berlin, O.
Innovation Elec. Co., Inc., New York. "Magic."
Keller Mfg. Co., Philadelphia, Pa. "Santo."
Koch & Nichols, Ann Arbor, Mich. "Ajax" Stationary.
J. Livingston & Co., New York, N. Y.
McCrum-Howell Co., New York, N. Y.
Menominee Elec. Mfg. Co., Menominee, Mich.
Milwaukee Vacuum Machinery Co., Milwaukee, Wis.
Monarch Vacuum Cleaner Co., New York.
National Vacuum Cleaner & Mfg. Co, Litchfield, Ill.
New York Vacuum Cleaner Co., Rahway, N. J.
Nohe Electric Renovator Co., Chicago, Ill.
Pacific Suction Cleaner Co., San Francisco, Calif. "Little Giant."
Palm Engineering Co., Detroit.
Perfection Vacuum Cleaner Co., Chicago, Ill.
Pnuevac Co., Boston, Mass.
Premier Vacuum Cleaner Co., Cleveland, Ohio.
Quam Pneumatic Cleaner Co., Waterloo, Iowa.
Regina Co., New York, N. Y.
Robertson Mfg. Co., Cincinnati.
C. B. Rumsey Engine & Machine Co., Friendship, N. Y.
Sanitary Vacuum Cleaner Co., Medford, Mass.
Shedd Electric Co., Roselle Park, N. J.
Spencer Turbine Cleaner Co., Hartford, Conn.
B. F. Sturtevant Co., Hyde Park, Mass.
Taber Pump Co., Buffalo, N. Y.
Thurman Vacuum Cleaner Co., St. Louis, Mo.
United Electric Co., Canton, O. "Tuec."
United States Vacuum Cleaner Co., Bradford, Pa. "New Maid."
United Vacuum Appliance Co., New York, N. Y.
Vacuum Engineering Co., New York, N. Y. ("Rotrex" Stationary.)
Vacuna Co., New York, N. Y.
Victor Cleaner Co., York, Pa.
Vortex Vacuum Co., Watertown, N. Y.
Winans Machine Co., Binghamton, N. Y.
Wise-Harrold Elec. Co., New Philadelphia, Pa. "Ohio."

VACUUM DRIERS.
See Driers.

VALVES, Safety.
American Steam Gauge & Valve Mfg. Co., Boston, Mass.
Crosby Steam Gauge & Valve Co., Boston, Mass.

VALVES, Steam and Water. (Electrically Operated.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis. (Solenoid.)
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., Boston, Mass.
Coldwell-Wilcox Co., Newburgh, N. Y. (Sluice Gates.)
Collins, G. W., Bridgeport, Conn.
Crane Co., Chicago, Ill.
Nelson Valve Co., Philadelphia, Pa.
Pelton Water Wheel Co., San Francisco, Cal.
Pittsburgh Valve, Foundry and Construction Co., Pittsburgh, Pa.
Pratt & Cady Co., Hartford, Conn.

Schutte & Koerting Co., Philadelphia, Pa.

VARNISH, Insulating.
Chicago Mica Co., Valparaiso, Ind. "Crystal."
General Electric Co., Schenectady, N. Y.
Packard Electric Co., Warren, O.
Sherwin-Williams Co., Cleveland, O. "Ajax."
Standard Paint Co., New York.
Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Benolite Co., Pittsburgh, Pa.
Calman & Co., E., New York, N. Y. "Ohmiac."
Central Paint & Supply Co., St. Louis, Mo. "Gilsolgloss."
Devoe & C. T. Raynolds Co., F W., New York, N. Y.
Dielectric Mfg. Co., St. Louis, Mo. "Potrote."
Dolph Co., John C., Newark, N. J. "Vaculite," "Wayahead." "Jayseedee."
Eagle Paint & Varnish Co., Pittsburgh, Pa.
McLee Electric & Mfg. Co., Brooklyn, N. Y. (Impregnating Compound.)
Mineraliac Electric Co., Chicago.
Muller & Schumann Co., Brooklyn, N. Y.
Schenectady Varnish Co., Schenectady, N. Y.
Standard Varnish Co., New York, N. Y. "Impregnite," "G. P." "Voltalac."
Sterling Varnish Co., Pittsburgh, Pa. "Motorlac."
Walpole Tire & Rubber Co., Walpole, Mass. "Insullac", "Armalac".

VEGETABLE PEELERS.
See Peelers.

VEHICLES, Electric.
See Automobiles.

VENTILATING FANS.
See Blowers.
(For small sizes, see Fans.)

VIBRATORS, Massage.
Hamilton-Beach Mfg. Co., Racine, Wis. "New Life".
Lindstrom-Smith Co., Chicago, Ill "White-Cross."
Manhattan Electrical Supply Co., New York, N. Y. "Premier," ("Gem" Battery Type), "Morrison," "Reliance."
Shelton Electric Co., New York, N. Y.
Allison Co., W. D., Indianapolis, Ind. "Bihlmaier."
Baker Electric Co., Hartford, Conn.
Barker, James, Philadelphia, Pa.
Birtman Electric Co., Chicago, Ill. "Bee."
Chicago Electric Vibrator Co., Chicago, Ill.
Clapp-Eastham Co., Cambridge, Mass.
Coates Clipper Mfg. Co., Worcester, Mass. "Rex," "Joy," "Giggle."
Crown Surgical Inst. Co., New York, N. Y.
Egan Electric Massage Vibratory Co., Petersburg, Ill.
Electric Mfg. Co., San Francisco Calif.
Matthew Engeln Electric Co., Chicago, Ill.
Globe Mfg. Co., Battle Creek, Mich.
Golden Vibrator Co., San Francisco, Cal.
R. Haas Electric & Mfg. Co. Springfield, Ill. "Ideal."
Horn Electric Co., Chicago, Ill
J. W. Hughes Co., New York, N. Y.
Illinois Appliance Co., Chicago, Ill. "Adaptable."
Keystone Elec. Co., Philadelphia
Kny-Scheerer Co., New York, N. Y. (Physicians'.)
McIntosh Battery & Optical Co., Chicago, Ill.
Meyer Co., Wm., Chicago, Ill.
Monarch Vibrator Co., Jackson, Mich.
National Elec'l Mfg. Co., New York, N. Y.
Royal Specialty Co., Cleveland, O. "Royal." "Rex."
Sanax Co., Inc., New York. "Sanax."
Shelton Elec. Co., New York.
Siebert-Welch Co., Massillon, O. "Insto."
Standard Electric Works, Racine Wis. "Arnold."
Stolz Electrophone Co., Chicago
Strand & Co., N. A., Chicago, Ill.
Swedish Elec. Vibrator Co., Chicago, Ill.
Universal Novelty Co., New York, N. Y. "Vibrosimplex."
Vibrassage Co., Chicago, Ill.
Victor Electric Co. Chicago, Ill
Waite & Bartlett Mfg. Co., New York. (Electro-Pneumatic.)
Wappler Elec. Mfg. Co., New York, N. Y.

VIBRATORS (For Foundries).
International Electric Tool Co., Milwaukee, Wis.

VISES, Linemen's.
Mathias Klein & Sons, Chicago, Ill.
Billings & Spencer Co., Hartford, Conn.
Dicke Tool Co., Downers Grove, Ill.

VOLTAGE REGULATORS.
See Regulators.

VOLTMETER SWITCHES.
See Switches.

VOLTMETERS.
See Ammeters.

VULCANIZERS, Electric.
Buffalo Electric Vulcanizer Co., Buffalo, N. Y.
Electric Vulcanizer Co., Minneapolis, Minn.
Gibney & Bros., James L., Philadelphia, Pa. ("Eleck-Trick.")

WAGONS, Tower.
General Vehicle Co., Long Island City, N. Y. (Electric Hurry-Up Wagon.)
Leonhardt Wagon Mfg. Co., Baltimore, Md.
McCardell & Co., J. R., Trenton, N. J. "Trenton."
Milburn Wagon Co., Toledo, O

WASHERS, Clothes (Motor Driven).
Automatic Electric Washer Co., Newton, Iowa.
Capital Electric Co., Chicago, Ill.
Conlon Electric Washer Co., Chicago, Ill.
Fairbanks, Morse & Co., Chicago.
Federal Sign System (Electric), Chicago, Ill. "Federal."
Horton Mfg. Co., Ft. Wayne, Ind.
Meadows Mfg. Co., Pontiac, Ill.
Western Electric Co., New York. "Western Electric."
Apex Appliance Co. Chicago, Ill.
Barnes Mfg. Co., Susquehanna, Pa.
Beebe Sales Co., Minneapolis.
White Lily Mfg. Co., Davenport, Iowa.
Blackstone Mfg. Co., Jamestown, N. Y.
Boss Washing Machine Co., Cincinnati, Ohio.
Combination Mfg. Co., Milwaukee, Wis. ("Ever Ready" and "Buster Brown.")
Conkling Co., Chicago, Ill.
Cycle Washing Machine Co., Chicago, Ill.
Darche Mfg. Co., Chicago, Ill.
Dodge & Zulli, Syracuse, N. Y ("Easy.")
Domestic Equipment Co., Chicago, Ill. "Oscillator," "Wizard."
Grinnell Washing Machine Co., Grinnell, Ia. "Elmo."
Hurley Machine Co., Chicago, Ill. "Red Electric", "Thor Electric".
Imperial Mfg. Co., Independence, Kans. (Washer & Wringer.)
Judd Laundry Machine Co., Chicago, Ill.
Maytag Co., Newton, Iowa.
National Laundry Machinery Co., Chicago, Ill.
National Motor Co, Springfield, Ohio.
Nineteen Hundred Washer Co., Binghamton, N. Y.
Rex Mfg. Co., Johnstown, Pa.
Rochester Rotary Washer Co., Rochester, N. Y.
Thistle Mfg. Co., Chicago, Ill.
Universal Motor Co., Chicago Ill
Upton Mfg. Co., St. Joseph, Mich. "Giant."
White Lily Mfg. Co., Davenport, Iowa.
Voss Bros. Mfg. Co., Davenport, Iowa.

WASHERS Dish (Motor Driven).
Western Electric Co., New York. "Western Electric".
G. S. Blakeslee & Co., Chicago, Ill
Fearless Dishwasher Co, Rochester, N. Y.
Gaira-Cochrane Mfg. Co., Chicago, Ill.
Hamilton-Low Co., New York, N. Y. "Vortex."
Insinger Co., Philadelphia, Pa.
Weis Mfg. & Supply Co., Hammond, Ind

WASHERS, Fibre.
See Fibre

WASHERS, Garage.
(For Cleaning Automobiles.)
Coates Clipper Mfg. Co., Worcester, Mass.
Perfect Mfg Co., Albany N Y

WASHERS, Leather, Nail Insulating.
Central Machinery and Supplies Co., New York City.
Eureka Supply Co., Sewell N J (Fibre Insulators)
Feeser Co., F S., Indianapolis, Ind
Indiana Leather Stamping Co., Williamsport, Pa.
Planet Co., Westfield, Mass.

WASHERS, Spring.
(For Knife Switches.)
Wallace Barnes Co., Bristol, Conn.
Metal Products Corporation, Providence, R. I.

WATCH DEMAGNETIZERS.
See Demagnetizers

WATCHMEN'S CLOCKS.
See Clocks.

WATER HEATERS.
See Heating Devices

WATERPROOF FIXTURES.
See Marine.

WATER WHEELS.
See Turbines, Water.

WATT-HOUR METERS.
Bristol Company, Waterbury, Conn.
Duncan Electric Mfg. Co., Lafayette, Ind. "Monetary."
Fort Wayne Electric Works, Ft. Wayne, Ind.
General Electric Co., Schenectady, N. Y. ("Thomson" Integrating "Wright" Prepayment.)
Roller-Smith Co., New York, "Columbia."
Sangamo Electric Co., Springfield, Ill.
Western Electric Co., New York.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Helios Mfg. Co., Philadelphia, Pa. ("Bastion" Electrolytic.)
Holcomb & Hoke Mfg. Co., Indianapolis, Ind.
Mineraliac Electric Co., Chicago, Ill. (Printing Attachments only.)

WAX, Insulating and Sealing.
Mitchell-Rand Mfg. Co., New York, N. Y. (Sealing and Insulating Waxes.)
Western Electric Co., New York.
W. H. Bowdlear & Co., Boston, Mass.
Candy & Co., Chicago, Ill.
Clark, Frank C., Chicago, Ill.
Cochrane Chemical Co., Jersey City, N. J. (Sealing Waxes.)
Hildreth & Segelken, New York, N. Y.
Insulatine Co., New York, N. Y. ("Gylte" Sealing and Insulating Waxes.)
Morningstar & Co., Charles, New York, N. Y. (Ceresine, Ozokerite and Sealing and Insulating Waxes.)
Smith & Nichols, New York, N. Y. (Ozokerite, Ceresine and Sealing and Insulating Waxes.)
Standard Oil Co., New York, N. Y. (Paraffine.)
Strohmeyer & Arpe Co., New York, N. Y. (Ozokerite, Ceresine, and Sealing and Insulating Waxes.)
Trotter & Co., E. T., Brooklyn, N. Y. (Insulating Waxes.)

WEBBING (For Tapes).
Belden Mfg. Co., Chicago, Ill.
Chicago Mica Co., Valparaiso, Ind.
Star Mica Mining Co., Inc., Canaan, N. H.
Hope Webbing Co., Providence, R. I.
Smith Webbing Co., Pawtucket, R. I.

WEIGHTS, Telephone Cord.
K & B Co., Philadelphia, Pa.

WELDERS, GAS.
Prest-O-Lite Co., Inc., Indianapolis, Ind.

WELDERS, Electric.
(Electric Welding Apparatus.)
Electric Controller & Mfg. Co., Cleveland O.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland, Ohio.
C & C Electric & Mfg. Co., Garwood, N. J.
Electric Ry. Improvement Co., Cleveland, O.
National Electric Welder Co., Warren, Ohio.
Thomson Elec. Welding Co., Lynn, Mass.
Toledo Elec. Welder Co., Cincinnati, O.
Universal Elec. Welder Co., Long Island City, N. Y.

WELDING, Repair (Repairing Broken Forgings or Castings.)
Davis Bournonville Co., New York.
Michigan Elec. Welding Co., Detroit, Mich.

WHEATSTONE BRIDGES.
See Instruments

WHISTLES, Automobile.
See Horns

WHISTLES, Steam, Electrically Operated.
Gamewell Fire Alarm Telegraph Co., New York
Garl Electric Co., Akron, O
Lunkenheimer Co., Cincinnati, O
Signal Control Co., New York, N. Y. (Electric Whistle Operator.)

WINDERS, Electro-Magnet.
Appleton Electric Co., Chicago Ill.
Belden Mfg. Co., Chicago, Ill.
Harvard Electric Co., Chicago.
Universal Winding Co., Boston Mass.

WINDING MACHINES.
See Machines.

WINDERS, Wire.
See Reels, Wire.

WINDLASSES, Arc Lamp.
Brady Electric Mfg. Co., New Britain, Conn.
Geo. Cutter Co., South Bend, Ind.
Ayer Mfg. Co., F. H., Chicago Heights, Ill.
Commercial Elec'l Supply Co., St. Louis, Mo. ("Eddy" Windlass.)
Creaghead Engrg. Co., Cincinnati Ohio.
Fletcher Mfg. Co., Dayton, Ohio
Fox-Multax Elec. Co., New York N. Y. ("Positive Safety" Winch.)
Line Material Co., South Milwaukee, Wis.

WIRE, Aluminum.
Driver-Harris Wire Co., Harrison N. J.

WIRE, Armature Banding.
American Electrical Works, Philipsdale, R. I.
American Steel & Wire Co., Chicago, Ill.
Belden Mfg. Co., Chicago, Ill.
Driver-Harris Wire Co., Harrison N. J. "Hercules."
Roebling's Sons Co., J. A., Trenton, N. J.
Herman Boker & Co., New York N. Y. (Importers.)
Washburn Wire Co., Phillipsdale R. I.

WIRE, Asbestos Covered.
American Steel & Wire Co., Chicago, Ill.
Belden Mfg. Co., Chicago, Ill.
D & W Fuse Co., Providence, R. I. "Deltabesten."
H. W. Johns-Manville Co., New York, N. Y.
Standard Underground Cable Co Pittsburgh, Pa.

WIRE, Bare Copper.
American Electrical Works, Philipsdale, R. I.
American Steel & Wire Co., Chicago, Ill.
Bridgeport Brass Co., Bridgeport Conn. "Phono-Electric."
Driver-Harris Wire Co., Harrison N. J.
Hazard Mfg. Co., Wilkes-Barre Pa.
National Conduit & Cable Co. New York, N. Y.
Phillips Insulated Wire Co., Pawtucket, R. I.
John A. Roebling's Sons Co. Trenton, N. J.
Rome Wire Co., Rome, N. Y. "Romeoid."
Standard Underground Cable Co. Pittsburgh, Pa.
Western Electric Co., New York
Westinghouse Electric & Mfg Co., East Pittsburgh, Pa.
Ansonia Brass & Copper Co New York, N. Y.
Benedict & Burnham Mfg. Co. Waterbury, Conn.
Chicago Insulated Wire & Mfg Co., Chicago, Ill.
Coe Brass Mfg. Co., Torrington Conn.
Detroit Copper & Brass Rolling Mills, Detroit, Mich.
Hudson Wire Co., New York, N. Y. (Small Sizes.)
Murray Wire Co., Newark, N. J
Spargo Wire Co., J. A., Rome N. Y.
Waclark Wire Co., New York

WIRE CONNECTORS.
See Connectors.

WIRE, Copper Clad.
John A. Roebling's Sons Co., Trenton, N. J.
Standard Underground Cable Co Pittsburgh, Pa. (Colonial.)
Western Electric Co., New York
Paragon Electric Co., Chicago, Ill

WIRE, Enameled.
Acme Wire Co., New Haven, Conn "Enamelite."
American Steel & Wire Co., Chicago, Ill.
Belden Mfg. Co., Chicago. "Cottonamel," "Beldenamel."
General Electric Co., Schenectady
Massachusetts Elec. Mfg. Co., West Lynn, Mass.
Roebling's Sons Co., J. A., Trenton, N. J.

Western Electric Co., New York.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Automatic Electric Co., Chicago.

Boller Insulated Wire Co., Chicago.
Bradford, Kyle & Co., Plymouth Mass.
Central Insulating Co., Lafayette, Ind.
Chicago Insulated Wire & Mfg Co., Chicago.
Dudlo Mfg. Co., Fort Wayne, Ind.
Massachusetts Elect. Mfg Co. West Lynn, Mass.
Murray Wire Co., Newark, N. J

WIRE, Fish.

Steel City Electric Co., Pittsburg, Pa. "Superior."
Western Electric Co., New York.
Jary Spring Works, New York
Swan Electric Co., Boston.

WIRE, Galvanized Strand.

American Electrical Works, Philipsdale, R. I.
American Steel & Wire Co., Chicago, Ill.
Hazard Mfg. Co., Wilkesbarre, Pa.
Roebling's Sons Co., John A., Trenton, N. J.
Broderick & Bascom Rope Co., St. Louis, Mo.
Leschen & Sons Rope Co., St Louis, Mo.
Macomber & Whyte Rope Co., Chicago, Ill.
Williamsport Wire Rope Co., Williamsport, Pa.

WIRE, Gas Fixture.

American Electrical Works, Philipsdale, R. I.
Belden Mfg. Co., Chicago, Ill.
Moore, Alfred F., Philadelphia, Pa.

WIRE GAUGES.
See Gauges.

WIRE, Iron.

American Steel & Wire Co., Chicago, Ill.
Driver-Harris Wire Co., Harrison, N. J.
General Electric Co., Schenectady, N. Y.
Hazard Mfg. Co., Wilkesbarre, Pa.
John A. Roebling's Sons Co., Trenton, N. J.
Western Electric Co., New York.
Crawfordsville Wire & Nail Co., Crawfordsville, Ind.
Indiana Steel & Wire Co., Muncie, Ind. "E. B. B." "Steel." "B. B."
Shenandoah Steel Wire Co., Buffalo, N. Y.
Washburn Wire Co., Phillipsdale, R. I.

WIRE, Magnet.

Acme Wire Co., New Haven, Conn. "Cottonite," "Silkenite."
American Electrical Works, Phillipsdale, R. I.
American Steel & Wire Co., Chicago, Ill.
Belden Mfg. Co., Chicago, Ill. "Cottonamel." "Silkenamel."
D & W Fuse Co., Providence, R. I. "Deltabeston."
Driver-Harris Wire Co., Harrison, N. J.
General Electric Co., Schenectady, N. Y.
Hazard Mfg. Co., Wilkesbarre, Pa
Massachusetts Electric Mfg. Co., West Lynn, Mass.
Moore, Alfred F., Philadelphia, Pa.
Roebling's Sons Co., J. A., Trenton, N. J.
Rome Wire Co., Rome, N. Y. "Romeoid."
Standard Underground Cable Co., Pittsburgh, Pa.
Western Electric Co., New York, N. Y. "Hawthorn."

Ansonia Electrical Co., Ansonia, Conn
Automatic Electric Co., Chicago.
Benedict & Burnham Mfg. Co., Waterbury, Conn.
cago.
Boller Insulated Wire Co., Chi-
Bradford, Kyle & Co., Plymouth, Mass.
Chicago Insulated Wire & Mfg. Co. Chicago, Ill.
Goldmark Co., James, New York, N. Y. (Sole Selling Agent New England Electric Works, Lisbon, N. H.)
McEvoy, C. H., Lowell, Mass.
Massachusetts Electric Mfg. Co., West Lynn, Mass.
Rome Electrical Co., Rome, N. Y.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Stuart-Howland Co., Boston, Mass. (Sole Selling Agents for Standard Magnet Wire Co. Claremont, N. H.)

WIRE, Phosphor Bronze.

Driver-Harris Wire Co., Harrison, N. J.
Standard Underground Cable Co., Pittsburgh, Pa.
Bradford, Kyle & Co., Plymouth, Mass.
Electrical Alloy Co., Morristown, N. J.
Murray Wire Co., Newark, N. J.
Phosphor-Bronze Smelting Co., Philadelphia, Pa. "Elephant."
P. S. Reeves & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Waterbury Mfg Co., Waterbury, Conn.

WIRE, Resistance.
(See Resistance)

WIRE, Rubber Covered. Rubber Covered Wire, Rubber Covered Cables, Flexible Cord, Annunciator Wire, Office Wire.

American Electrical Works, Philipsdale, R. I. "Americanite."
American Steel & Wire Co., Chicago, Ill. "Americore," "Amerite."
Atlantic Insulated Wire & Cable Co., New York, N. Y. "Neptune," "Dolphin," "Triton," "Beacon."
Belden Mfg. Co., Chicago, Ill.
Detroit Insulated Wire Co., Detroit, Mich.
Driver-Harris Mfg. Co., Harrison, N. J. (Flexible Cord.)
Electric Cable Co., Bridgeport, Conn.
General Electric Co., Schenectady.
Habirshaw Wire Co., Yonkers, N. Y. "Attix."
Hazard Mfg. Co., Wilkes-Barre, Pa. "Penn New Code," "Hazard High Grade," "Hazard 30% Para."
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. "Peerless," "Paranite."
Kerite Insulated Wire & Cable Co., New York, N. Y.
Lowell Insulated Wire Co., Lowell, Mass.
Marion Insulated Wire & Rubber Co., Marion, Ind. "Eagle."
Moore, Alfred F., Philadelphia.
National Conduit & Cable Co., New York.
New York Insulated Wire Co., New York, N. Y. "Raven Core." "Grimshaw White Core."
Okonite Co., The, New York, N. Y.
Phillips Insulated Wire Co., Pawtucket, R. I. "Parac."
Roebling's Sons Co., John A., Trenton, N. J.
Rome Wire Co., Rome, N. Y. "Romeoid."
Safety Insulated Wire & Cable Co., New York.
Simplex Wire & Cable Co., Boston, Mass. "Simcore." "Simplex Caoutchouc" (Simplex "B. C.").
Sprague Electric Works, New York, N. Y. ("Greenfield" Steel Armored Flexible Cord.)
Standard Underground Cable Co., Pittsburgh, Pa. "Tip-Top," "Sterling."
Western Conduit Co., Youngstown, Ohio. "Realflex."
Western Electric Co., New York.
Bay State Insulated Wire & Cable Co., Hyde Park, Mass. "Maconite."
Bishop Gutta Percha Co., New York. "Parayel." ("Creffield" Cord), "Balata."
Boston Insulated Wire & Cable Co., Boston, Mass.
Bourn Rubber Co., Providence, R. I.
Brixey, W. R., New York City.
Collyer Insulated Wire Co., Pawtucket, R. I. "I. X. L."
Crescent Insulated Wire & Cable Co., Trenton, N. J.
Flexible Conduit Co., Penn Yan, N. Y.
B. F. Goodrich Co., Akron, O. "Diamond N. E. Code." "Diamond Special 30 per cent." "Diamond L." "Diamond 30 per cent Para."
Goodyear Rubber Insulating Co., New York.
National India Rubber Co., Bristol, R. I.
Waterbury Co., New York.

WIRE SCRAPERS.
See Tools, Linemen's.

WIRE STRAIGHTENERS.
See Straighteners, Wire

WIRE STRETCHERS.
See Comealongs.

WIRE, Weatherproof.

American Electrical Works, Philipsdale, R. I. "Star."
American Insulated Wire & Cable Co., Chicago, Ill.
American Steel & Wire Co., Chicago, Ill. "Reliance."
General Electric Co., Schenectady.
Hazard Mfg. Co., Wilkes-Barre, Pa.
Moore, Alfred E., Philadelphia.
National Conduit & Cable Co., New York, N. Y.
Okonite Co., The, New York, N. Y. "Candee."
Phillips Insulated Wire Co., Pawtucket, R. I. "O. K."
Roebling's Sons Co., J. A., Trenton, N. J.
Rome Wire Co., Rome, N. Y. "Romeoid."
Simplex Wire & Cable Co., Boston, Mass. "Simcore." "Simplex Caoutchouc" (Simplex "B. C.")
Standard Underground Cable Co., Pittsburgh, Pa.
Western Electric Co., New York.
Ansonia Electrical Co., Ansonia, Conn. "Shield."
Benedict & Burnham Mfg. Co., Waterbury, Conn. "K. K."
Chicago Insulated Wire & Mfg. Co., Chicago, Ill.
Collyer Insulated Wire Co., Pawtucket, R. I. "New Code," "I. X. L."
Dielectric Co. of America, Belleville, N. J. "D. E."
McEvoy, C. H., Lowell, Mass.
Monarch Electric & Wire Co., Chicago, Ill.
Sterling Insulated Wire Co., Chicago, Ill.
Waclark Wire Co., New York.

WIRING DEVICES.

Wiring Equipment Co., New York City.

WIRELESS APPARATUS.

Manhattan Electrical Supply Co., New York, N. Y.
Menominee Elec. Mfg. Co., Menominee, Mich.
Western Electric Co., New York.
Alden Wireless Co., Campello, Mass.
Clapp-Eastman Co., Cambridge, Mass.
Geo. W. Conner, Malden, Mass.
Dawson & Winger Electric Co., Chicago, Ill.
Eastern Scientific Apparatus Co., Mass.
Electro Importing Co., New York.
Marconi Wireless Tel. Co., New York, N. Y.
Wm. J. Murdock Co., Chelsea, Mass.
Queen-Gray Co., Philadelphia, Pa.
Roentger Mfg. Co., Philadelphia, Pa.
Standard Wireless Equipment Co., Los Angeles, Cal.
Thomas St. John, New York, N. Y.
C. H. Stoelting Co., Chicago, Ill.
Telefunken Wireless Telegraph Co., New York, N. Y.
Wappler Electric Mfg. Co., New York, N. Y.
Wireless Specialty Apparatus Co., New York.

WOOD FIXTURES.
See Fixtures, Wooden.

WRAPPERS, Tungsten Lamp.
See Boxes

WRAPPERS, Conduit Joint.
Philadelphia Electrical & Mfg Co., Philadelphia, Pa.

WRENCHES.

Klein & Sons, Mathias, Chicago Ill. (Lag Screw, Tie and Spiking.)
Smith & Hemenway Co., New York.
Tudor Mfg. Co., Taunton, Mass ("Bay State" Cross Arm.)
Yost Electric Mfg. Co., Toledo, O "Falcon" (Fixture Wrenches.)

X-RAY APPARATUS.

Campbell Electric Co., Lynn Mass.
Dubilier Elec. Co., Inc., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Anderson, Norden & Co., Chicago, Ill. "Nelson."
Baker Electric Co., Hartford Conn.
Birtman Electric Co., Chicago, Ill.
Clapp-Eastham Co., Boston Mass. ("Ceco" and "Quality" Coils.)
Electric Mfg. Co., San Francisco, Calif.
Electro Importing Co., New York.
Engeln & Co., H. P., Cleveland O.
Matthew Engeln Elec. Co., Chicago, Ill.
Foote, Pierson & Co., New York
Jackson, F. E., Orange, N. J.
Kelley-Koett Mfg. Co., Covington, Ky. "Grosse Flamme" (Coil).
Keystone Electric Co., Philadelphia, Pa.
Kny-Scheerer Co., New York.
Lamont, G. E., San Francisco, Calif.
Macalaster-Wiggin Co., Boston Mass.
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Sirch Electrical and Testing Laboratories, Los Angeles Calif.
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H. W. Johns-Manville Co., New York.
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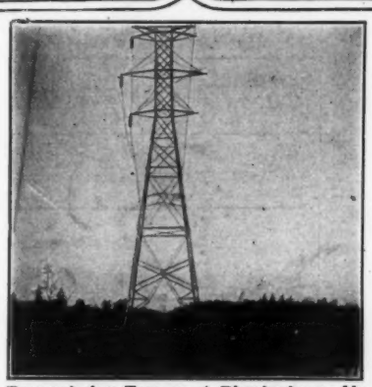
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SAN FRANCISCO, CAL., Rialto Building
Portland, Ore. . . . . Selling Building
Seattle, Wash., 4th Ave. So. Cor. Conn. St.
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The rate for "Positions Wanted" advertisements is two cents per word, minimum charge 50 cents an insertion, payable in advance. Remittances and copy should reach this office not later than Monday 12 o'clock noon, for the next succeeding issue.

Replies may be sent in care of Electrical Review and Western Electrician, 608 So. Dearborn Street, Chicago, or 13-21 Park Row, New York.

ELECTRICIAN— Eight years' electrical construction and operating experience. Have also had 2 years' experience with selective ringing central energy telephone system. Can furnish A1 references as to character and workmanship. Open for engagement Jan. 15. Will go anywhere. Address No. 1993, Electrical Review & Western Electrician, Chicago.

A REAL POWER SALES ENGINEER— There's only about a dozen of us in the entire industry; if you are big and progressive and want such a man, get busy between now and January 1. Would consider efficiency or production work with industrial enterprise, if broad field. Address No. 2005, Electrical Review and Western Electrician, Chicago.

POSITION WANTED—A winder and repairman on A. C. and D. C. motors and generators, also transformers, rectifiers, meters, etc., desires steady position. Will go anywhere. Address, No. 2000, Electrical Review and Western Electrician, Chicago.

SALESMAN—Eastern headquarters, with established trade wishes a line either exclusively, or in conjunction with other goods, for the east, south and southwest. Address No. 2006, Electrical Review and Western Electrician, Chicago.

HELP WANTED

The rate for "Help Wanted" advertisements is three cents a word, minimum charge $1.50 an insertion, payable in advance. Remittances and copy should reach this office not later than Monday, 12 o'clock noon, for the next succeeding issue.

WANTED—Technical educated young men for work in our testing departments. Good opportunities for experience are to be had. Apply by letter, Employment, Box 911, Pittsburgh, Pa.

WANTED—Manager for water power electric light plant, also telephone plant, in tropical Spanish country. Location healthful. Only those who can speak Spanish considered; must be well qualified in construction and maintenance. Give your experience fully, age, salary expected, with photo and reference. Address No. 2004, Electrical Review and Western Electrician, Chicago.

MISCELLANEOUS

The rate for "Miscellaneous" advertisements is three cents a word, minimum charge of $1.50 an insertion, payable in advance. Remittances and copy should reach this office not later than Monday, 12 o'clock noon, for the next succeeding issue.

Replies may be sent in care of Electrical Review and Western Electrician, 608 So. Dearborn Street, Chicago, or 13-21 Park Row, New York.

MANUFACTURING BUSINESS FOR SALE Growing manufacturing industry, catering to the Electrical Trade, would sell its entire holdings, or controlling interest to parties who could supply ample working capital to double present out-put. Splendid sales connections afford plenty orders. Export business growing rapidly. Can secure more than $100,000 gross business for 1916, conditional we can assure our customers of handling their demands. Thirty thousand dollars will purchase entire holdings. The real estate alone would cost as much to duplicate. Controlling interest may be had by purchase of certain holdings. Present owners not electrical men, but would allow their monies to remain in the business and accept the company's securities. Entire organization, which is very efficient may be retained. Address: No. 2007, Electrical Review and Western Electrician, Chicago.

WANTED—Two Second Hand, three phase, 60 cycle, 2,300 volt, 200 R. P. M., 300 to 400 K. V. A., direct connected waterwheel type alternators, complete with base, bearings and shaft, with or without exciter and switchboard. Good condition. Give description, price and delivery. Wausau Street Railroad Company, Wausau, Wis.

WANTED

Used 3-phase, 60 cycle, induction, 220-volt or 440-volt, 10, 15, 25 and 35 H. P., in operating conditions. C. J. & F. E. Briner, St. Louis, Mo.

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One 65 K. W. Belted Generator, 110 Volt, D. C.
One 75 K. W. Belted Generator, 220 Volt, D. C.
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One 14x14 Ball High Speed Engine.
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WANTED—Second Hand A.C. Generators: Two 3-phase 60 cycle, 2300 volts, 150-250 K.V.A., belted A.C. Generator, with or without exciters and switchboards. Good condition. Give description, price and delivery. Wausau Street Railroad Company, Wausau, Wis.

FOR SALE—7½ horsepower Century motor; 60-cycle, one-phase, 110 or 220 volts. Used three months. Best offer takes it. Address, Electrical Service Co., Crystal Lake, Ill.

FOR SALE—Electric light plant for sale in growing Montana town, December earnings $800. Price $8,500. Address: No. 2003, Electrical Review and Western Electrician, Chicago.

FOR SALE—5,000 ft. Roebling's No. 18 new black silk lamp cord N. C. $16.00 M. Electric Purifying Water Co., East Liverpool, Ohio.

FOR SALE—Electric light plant in growing Montana town. Address No. 2003, Electrical Review and Western Electrician, Chicago.

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GREGORY ELECTRIC CO.

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Send for our "MONTHLY BARGAIN SHEET," showing complete stock with net prices.

220 to 250 Volt D.C. Generators

	K. W.		Speed
1	25	Gen. Elec., type CL	1650
1	35	Gen. Elec.	975
1	35	Gen. Elec., Curtis turbine	3600
1	40	Western Electric	650
1	50	Allis-Chalmers, Ridgeway self-oiling engine	275
1	60	Western Elec., 3-wire, double commutator, 115-230 volts, 250 amp. each side	750
1	65	Gen. Elec., MP., form H	875
1	75	Gen. Elec., type DLC, interpole	700
1	75	Allis-Chalmers, 6-pole	460
1	85	Westinghouse, type S-13L	750
1	100	Westinghouse, type M.	700
1	100	Western Elec., type L4	575
1	100	Westinghouse, direct-con. Ideal self-oiling engine	250
1	100	Milwaukee, direct-con. to Buckeye engine	250
1	150	Willey, direct-con. to 4-valve Atlas engine	225
1	240	Crocker-Wheeler, MP, direct-con. to cross-compound Vilter-Corliss engine	120

125 Volt D.C. Generators

5	2	Northern, 80 light, new	700
1	3½	Northern, 140 light	320
1	4	Allis-Chalmers, 160 light	1250
1	5	Otis, 200 light	450
1	5.62	Westinghouse, 225 light	1400
1	6	Northern, 240 light	2100
1	6	Northern, 240 light	1600
1	6	Colonial	1050
1	6¼	Commercial	960
2	7½	Roth	1500
1	7½	Westinghouse	1450
1	7½	Triumph	1400
1	7½	Peerless	1200
1	7½	Western Elec.	500
1	8½	Browning	1050
1	10	Ft. Wayne	1400
1	10	Triumph	1150
1	12½	Western Elec.	1650
5	12½	Gen. Elec.	1150
1	15	National	1750
1	15	Willey	950
1	16½	Westinghouse, type S	450
1	17½	Roth	1150
1	17½	Westinghouse	1050
1	17½	Sprague	900
1	20	Commercial	1280
1	20	Northern	750
1	25	Gen. Elec., Curtis turbine	3600
1	25	Gen. Elec., direct-con. to Westinghouse gas or gasoline engine	350
1	30	Northern	1000
1	30	Westinghouse, 6-pole direct-con. to Buckeye engine	350
1	40	Sprague-Lundell	725
1	40	Westinghouse, type M.	550
1	45	Gen. Elec.	975
1	50	Triumph	615
1	55	Westinghouse	800
1	55	Sprague	625
2	60	Northern	825
1	62½	Westinghouse, direct-con. to Atlas 4-valve engine	275
1	65	Gen. Elec.	825
1	70	Ft. Wayne	900
1	75	National	750
2	75	Westinghouse	750
2	80	Triumph	750
1	100	Allis-Chalmers	650
1	100	Milwaukee	575
1	100	Triumph	500
1	125	Milwaukee	450
2	150	Westinghouse	475

3-Phase, 60-Cycle Alternators

	K. V. A.		Speed
1	20	Fairbanks-Morse, 240 volts	1200
1	50	Westinghouse, 240 v.	1200
1	50	Westinghouse, 440 v. to Ball engine	275
1	75	Triumph, 220 or 440 v.	900
1	100	Gen. Elec., ATB, 240 volts	900
1	100	Westinghouse, 240 v.	900

Large stock of 2300 volt, 2 and 3-phase generators.

3-Phase, 60-Cycle A.C. Motors—220-240 Volts

	H. P.		Speed
1	10	Gen. Elec., form K	1200
1	15	Gen. Elec., form L	720
1	15	Westinghouse, type CCL, back-geared	690-175
1	20	Fairbanks-Morse	1200
1	20	Lincoln	1200
1	20	Richmond	1140
10	20	Westinghouse	1120
1	25	Gen. Elec., form K	1200
9	30	Westinghouse	1120
3	30	Westinghouse, CCL	1120
1	35	Western Elec.	900
1	35	Allis-Chalmers	850
1	40	Fairbanks-Morse	1200
9	40	Westinghouse	850
1	50	Westinghouse	1120
2	50	Gen. Elec., type K	900
6	50	Westinghouse	850
1	55	Gen. Elec.	514
1	75	Gen. Elec.	900
3	75	Westinghouse	850
8	125	Westinghouse, slip-ring	580
1	150	Westinghouse, direct-con. to American centrifugal pump	1120
1	150	Gen. Elec., form K	720

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We have an enormous stock 110-220-550 v., D.C. and single-phase, two-phase and three-phase alternating current, all sizes, makes and speeds. Send for correct list. Just out.

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SAN FRANCISCO, Sheldon Building
NEW ORLEANS, Shubert Arcade
DENVER, 435 Seventeenth Street
SALT LAKE CITY, 313 Atlas Block
CHICAGO, Marquette Building
ATLANTA, GA., Candler Building
CLEVELAND, New England Building
CINCINNATI, O., Traction Building
SEATTLE, Mutual Life Building
HAVANA, CUBA, 116½ Calle de la Habana
LOS ANGELES, American Bank Building

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PENRHYN PURPLE

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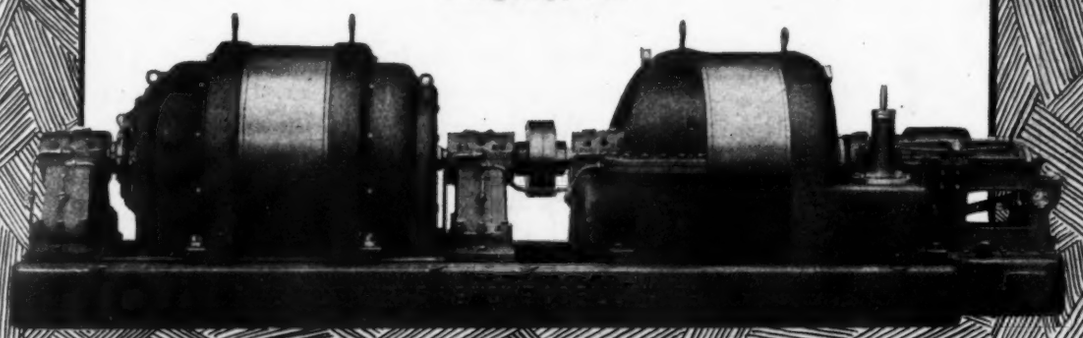

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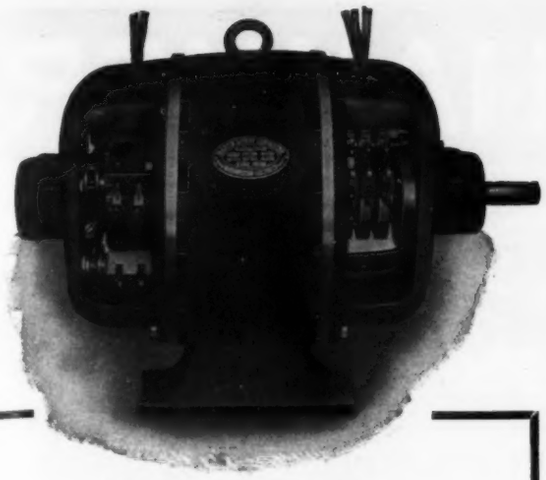

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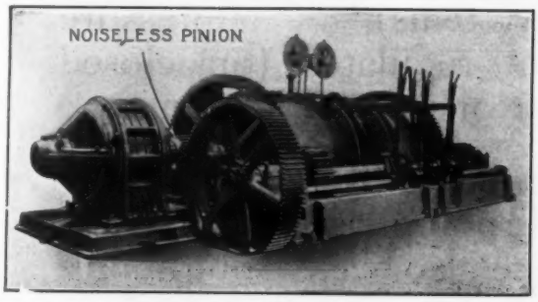

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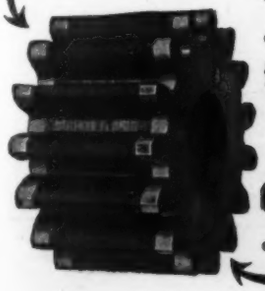

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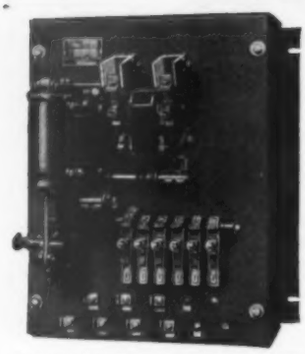

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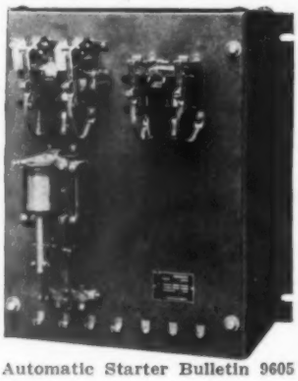

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To widen the application of alternating current motors and provide convenient control, four new starters have been designed.

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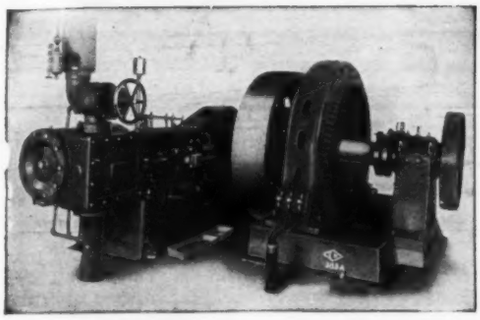

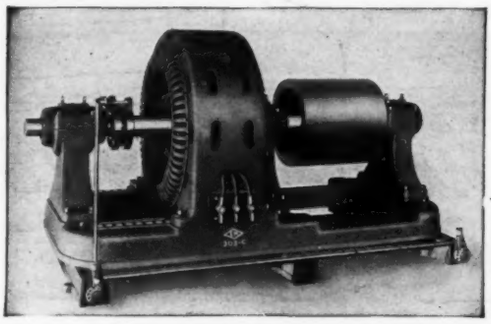

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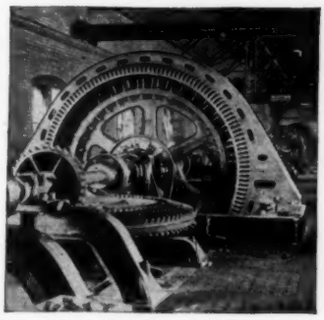

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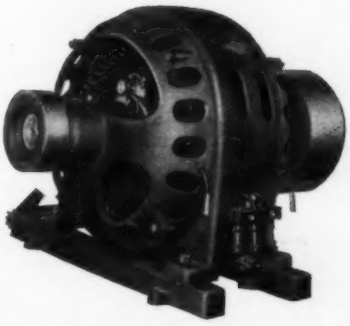

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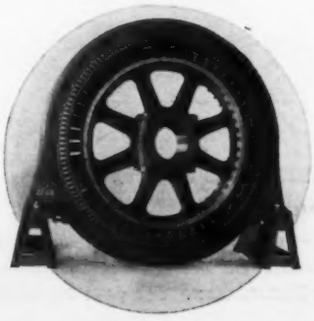

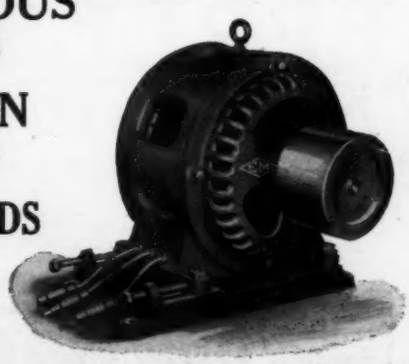

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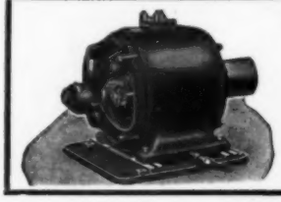

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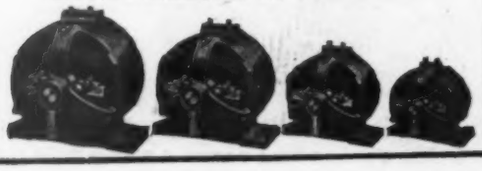

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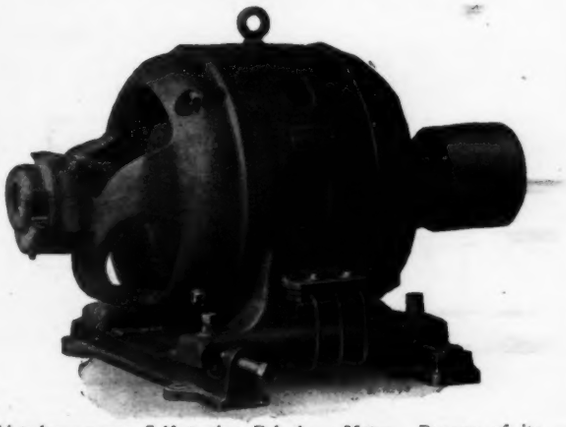

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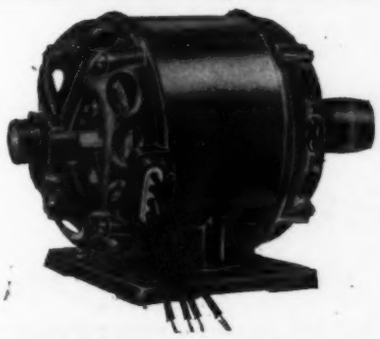

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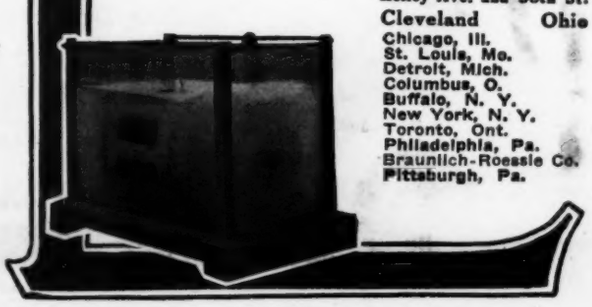

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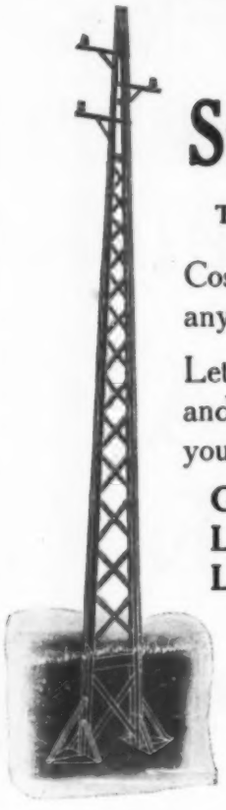

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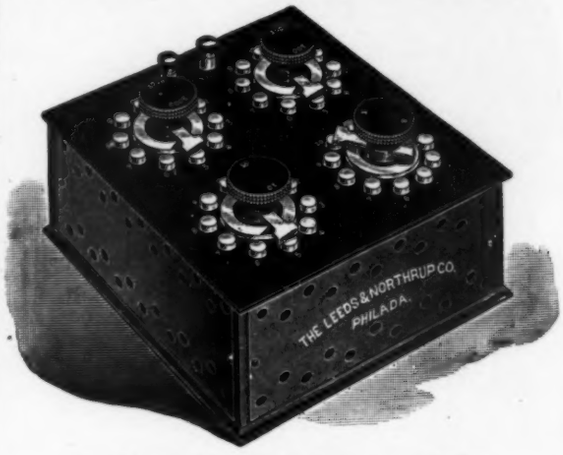

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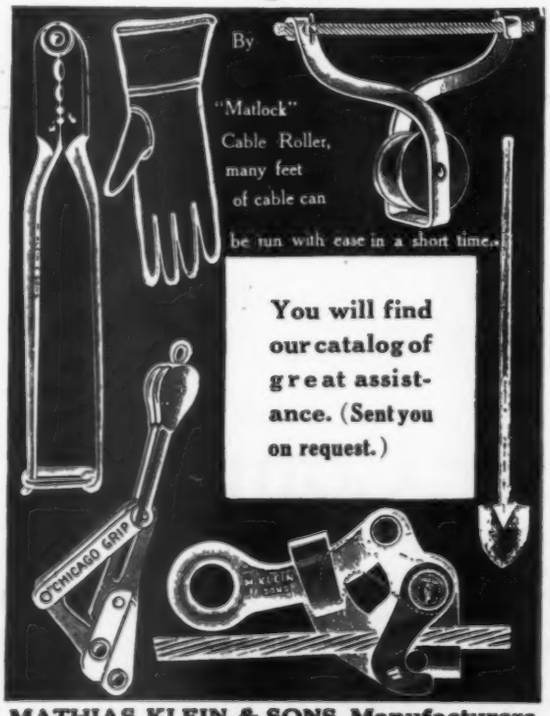

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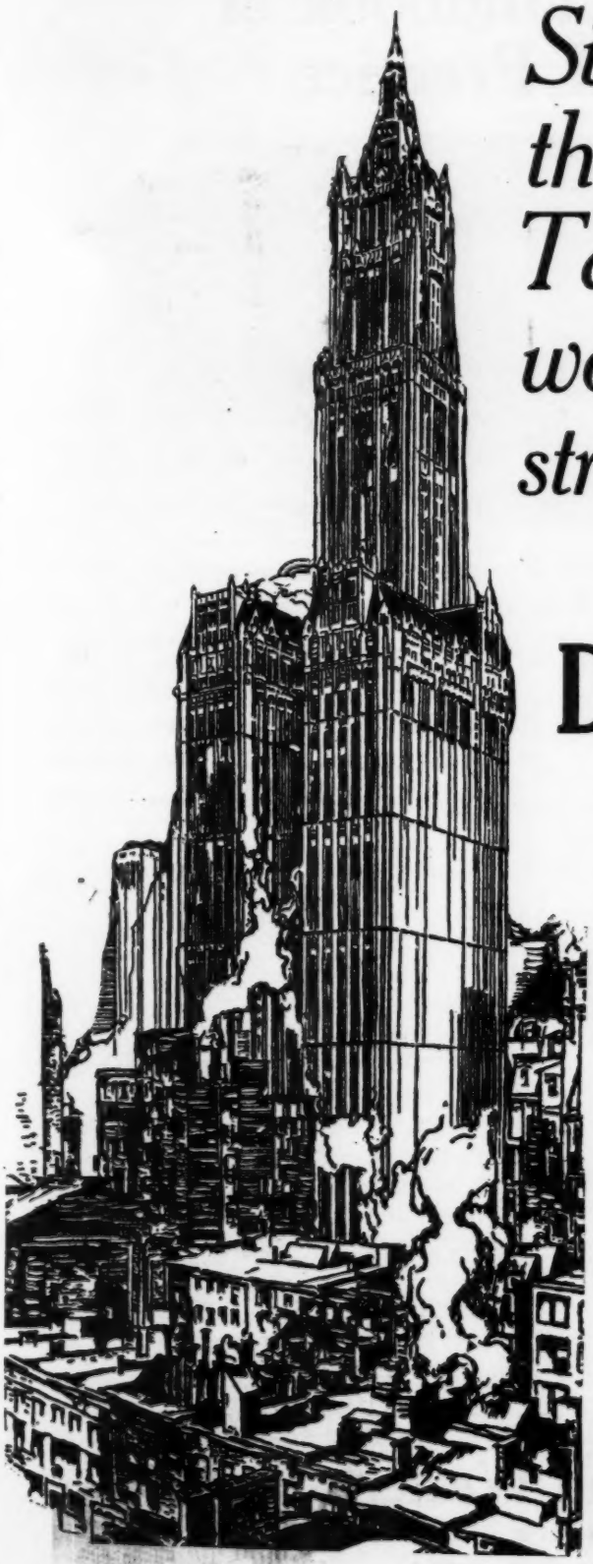

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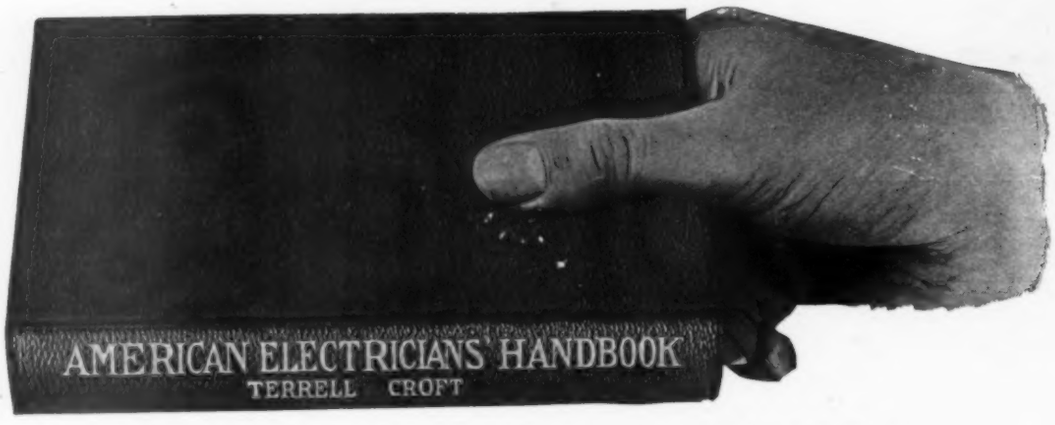

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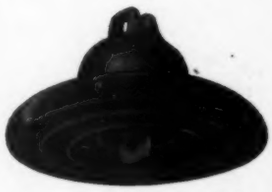

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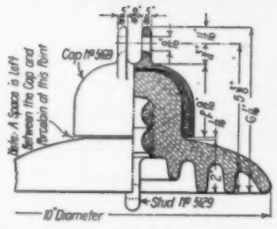

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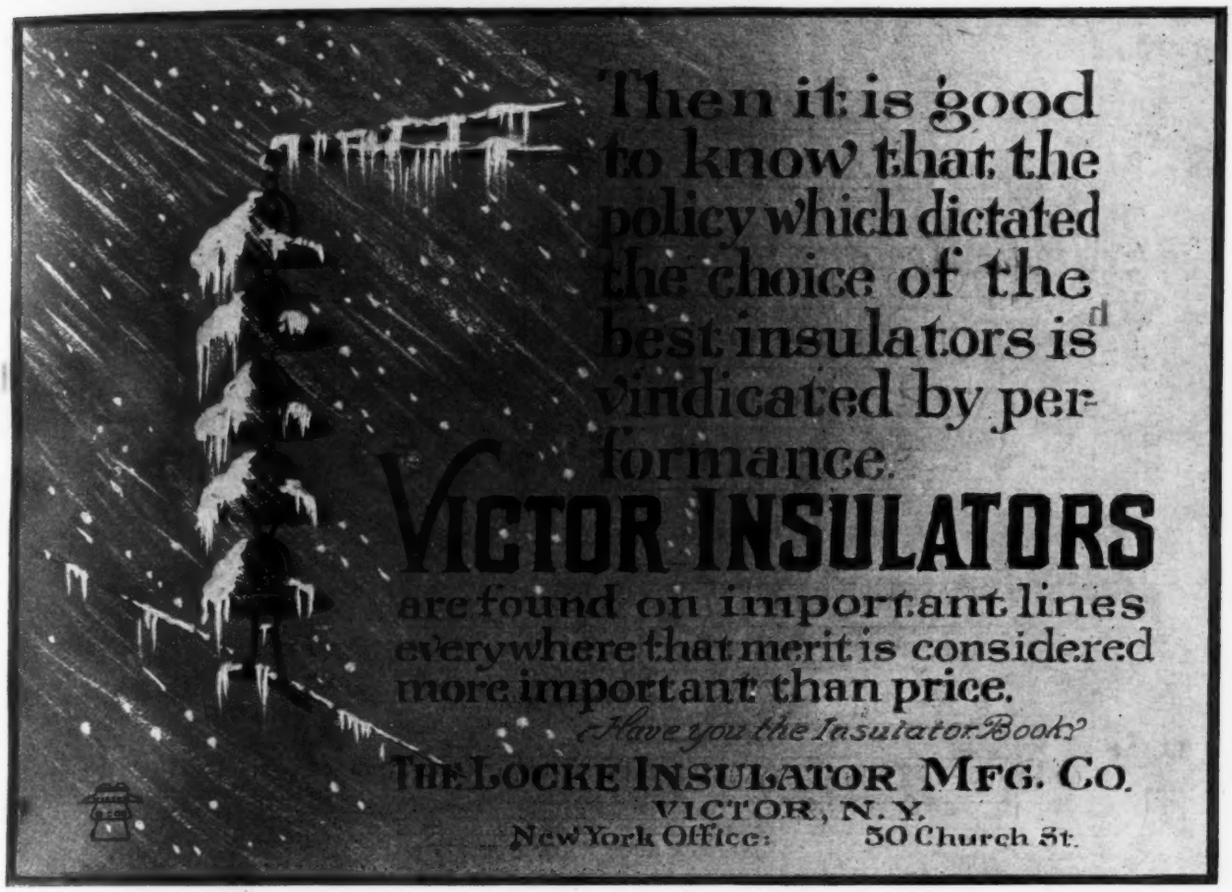

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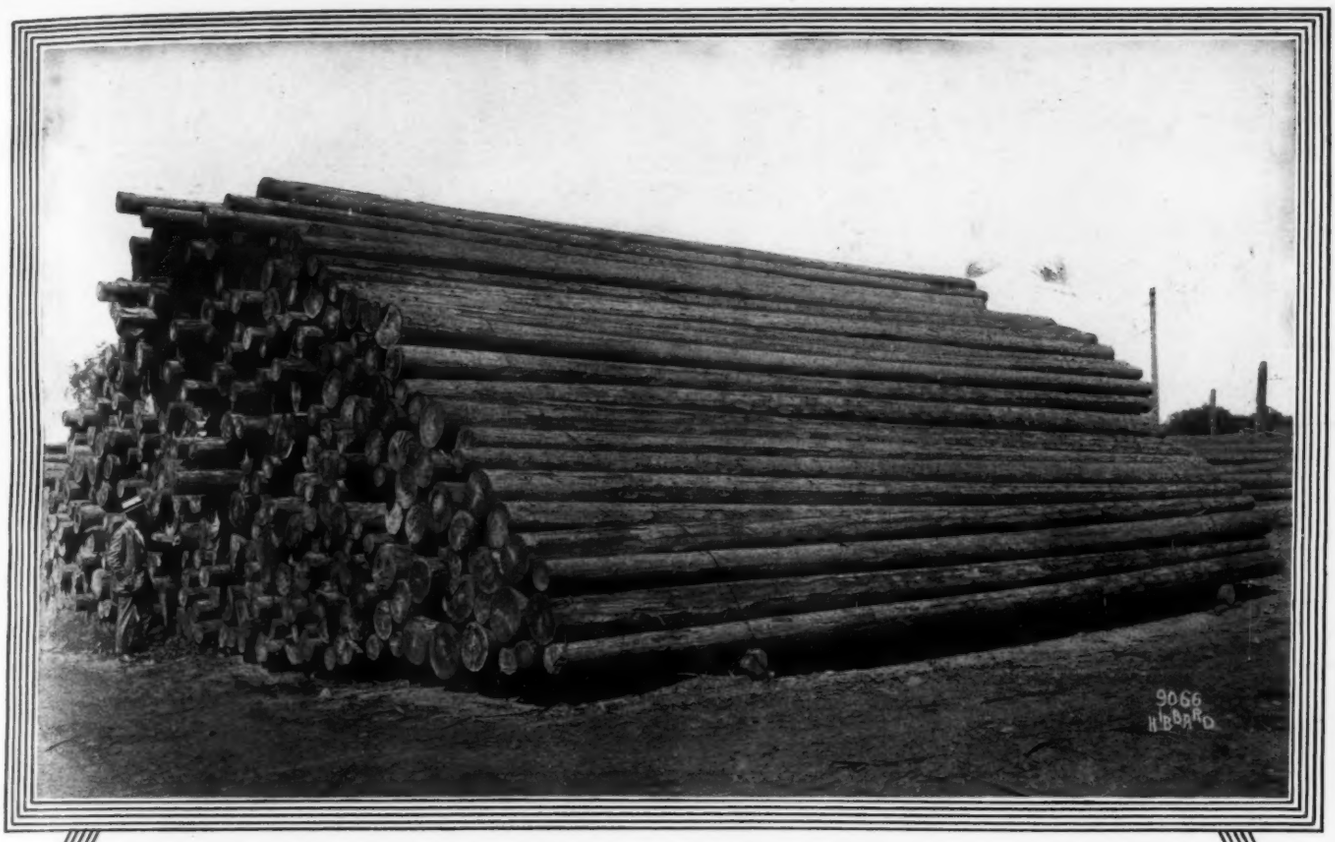

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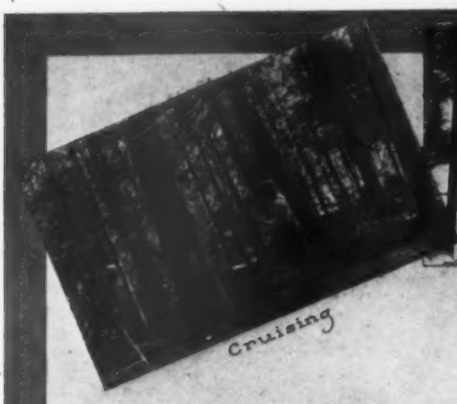
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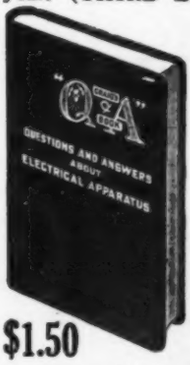

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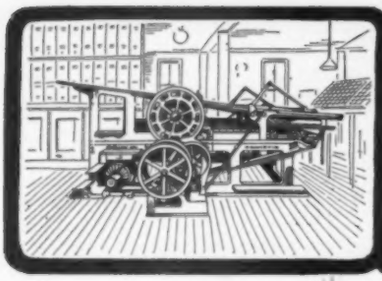

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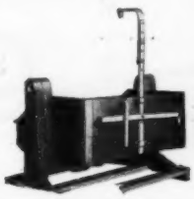

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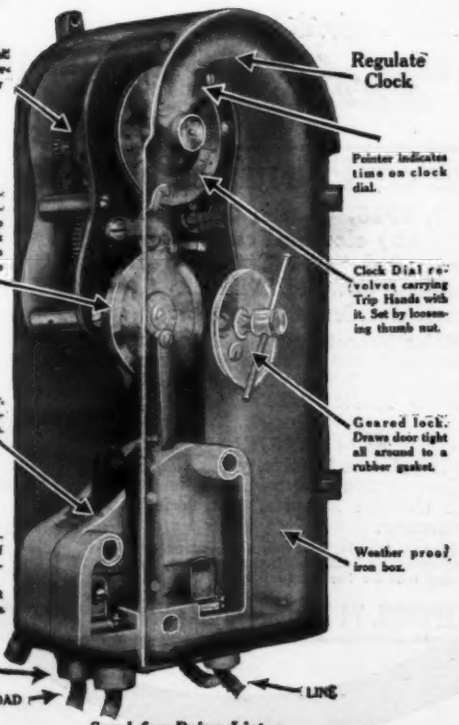
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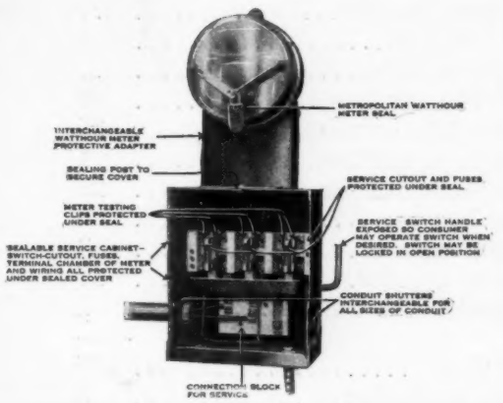
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Gas utilities	4	45	19	2
Motor carriers	..	18	5	3
Railroad carriers	60	294	56	8
Street R.R. carriers	15	58	13	2
Telegraph utilities	1	9	..	..
Telephone utilities	22	97	36	10
Warehouses	4	2	1	.
Water carriers	3	2	1	.
Water utilities	17	57	18	2
Miscellaneous utilities	1	9	1	..
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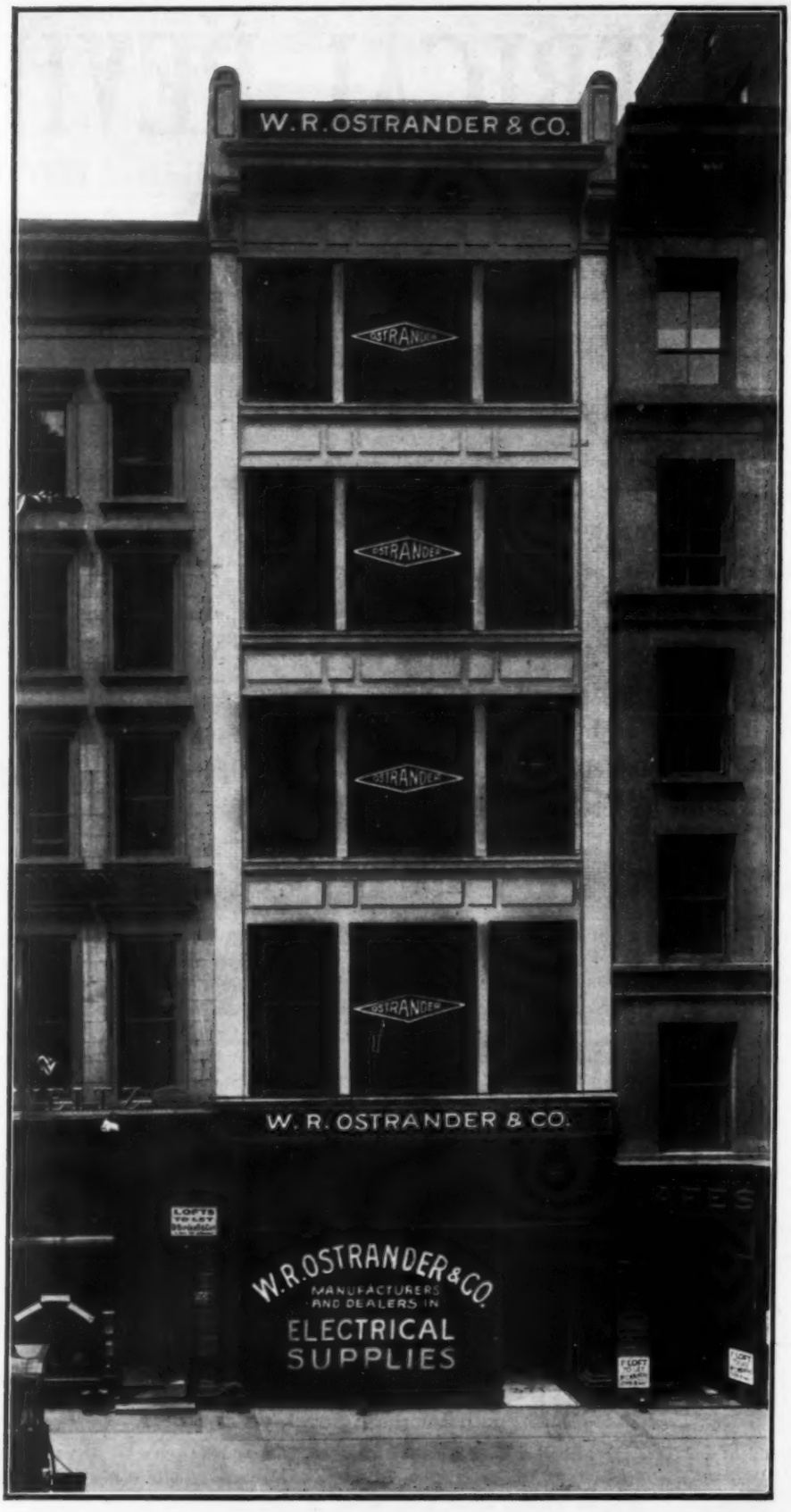

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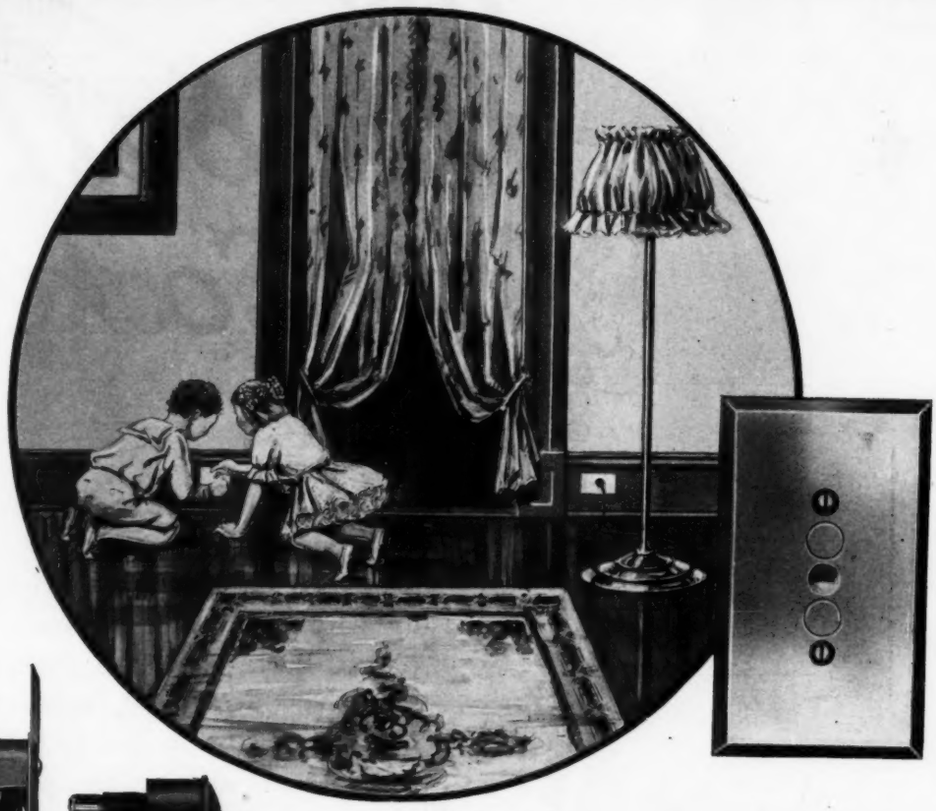

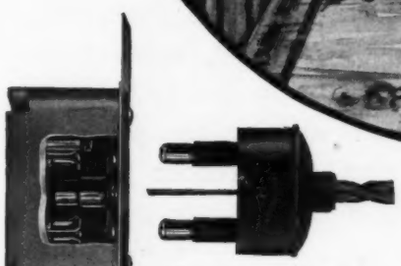

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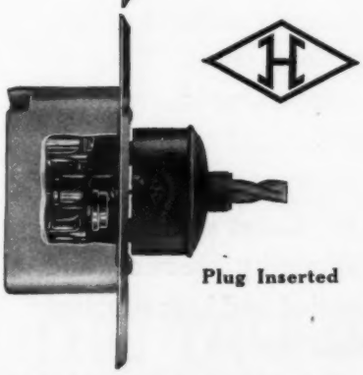

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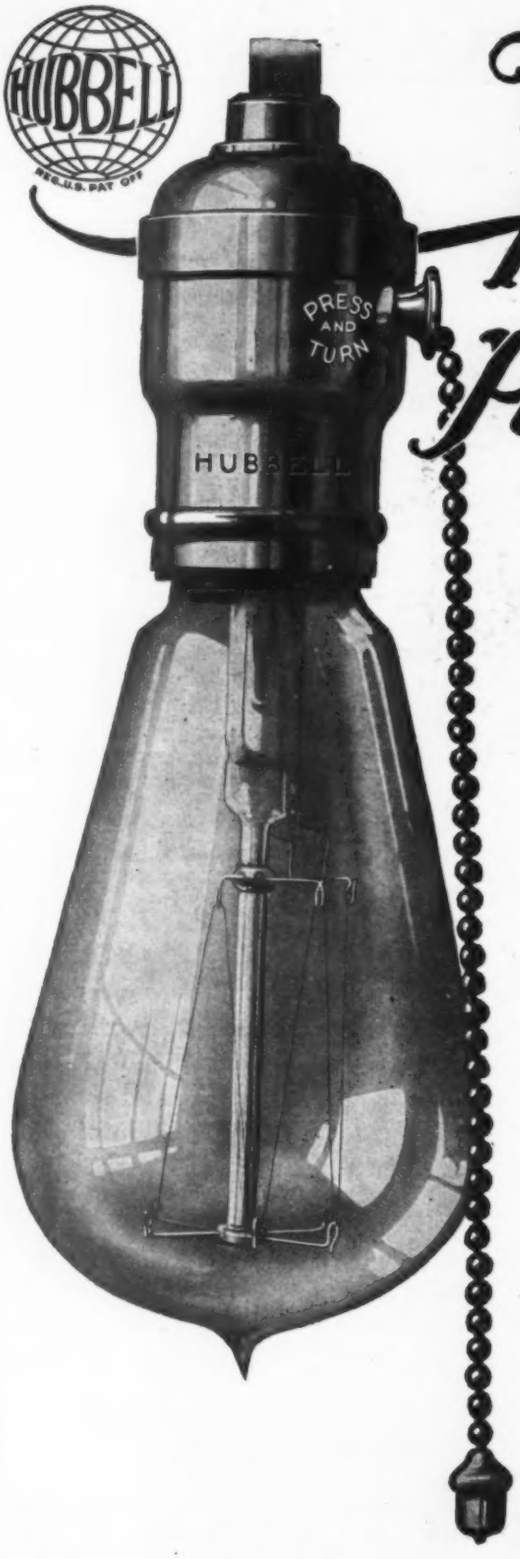

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HARVEY HUBBELL, Inc., Bridgeport, Conn.

"CIRCLE T"

Combination Switch (No. 701) In Safety Box

Size of Box
W 8" x L 4½" x D 3⅝"

Handle holds box closed—switch connected—box cannot be opened without disconnecting switch—box can be locked.

Can furnish Nos. 5640 and 5644 from stock. A little delay on Quick Break type because of slow freight and hold up on steel.

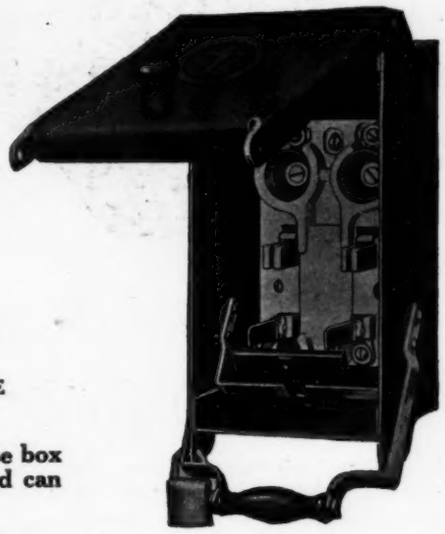
Externally Operated
(Patented)

A New Line—
A Seller from the first minute

SIMPLE, EFFECTIVE
AND
REASONABLE IN PRICE

When switch is in running the box is held closed by handle and can be locked.

Box cannot be opened without disconnecting switch. Can be locked or sealed open.



No. 701 (2-Pole Combination Switch for plug fuses) in safety box. Note that the throw of the handle which holds cover closed also connects switch. Padlock or wire for sealing can be placed through hole in side of handle and the locking lug on either or both sides.

New Design No. 701
4 13-16 in. x 3 in.
Std. Pkg., boxed 122 lbs.

NEW DESIGN
No. 701 Combination Switch

The cut illustrates the new design of our No. 701 which is used entirely in our SAFETY BOXES.

This design is to supersede our old style.

These are much smaller, being 4 13/16" x 3" and much lighter, weighing only 122 lbs. per 100, boxed. Each switch is 5 oz. lighter than the old style.

They are in every way up to the standard of our old design, but the new construction of blade end and spade handle at an angle (see cut), saves room and throws the handle over the fuses without necessitating the high hollow base formerly used.

"STANDARD" Attachment Plug

Cat. No.		S. P.	List
792	Complete	100	$0.25
793	Body only	100	.10

Wt., Std. Pkg., Boxed, 792, 25 lbs. 793, 15 lbs.

DISCOUNT—UNDER TRUMBULL SCHEDULE B. Carton 10

Made throughout of fire-proof material.

Prong type, Straight Pull.

Cap is well proportioned and top of body is rounded to prevent breakage.

Caps will interchange with all Standard plugs and bodies on the market.

A seven pound pull separates cap from base.

Cat. No. 782

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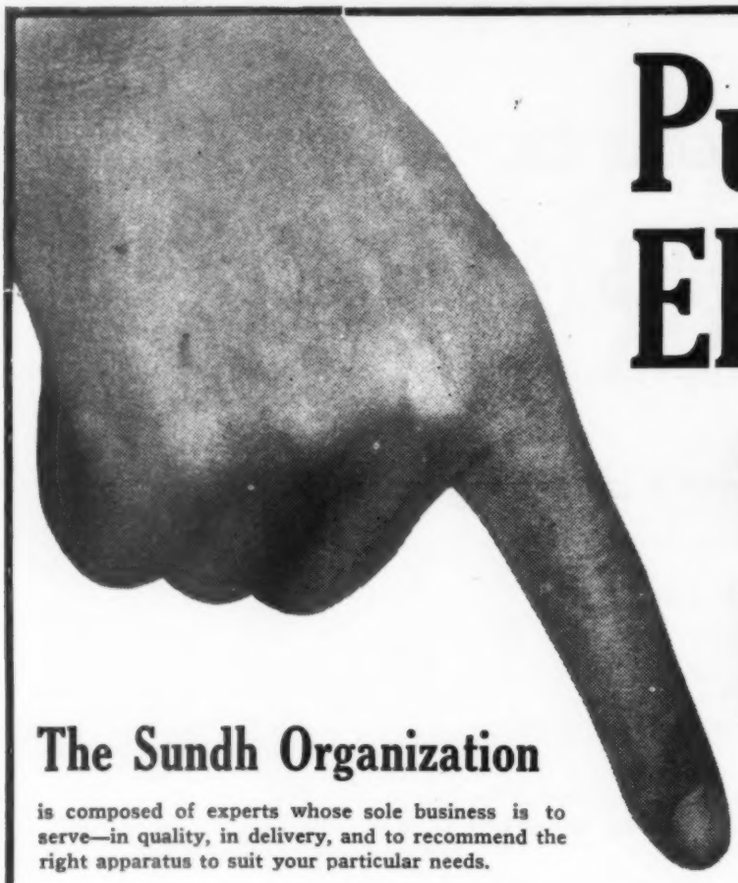

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Sundh Apparatus

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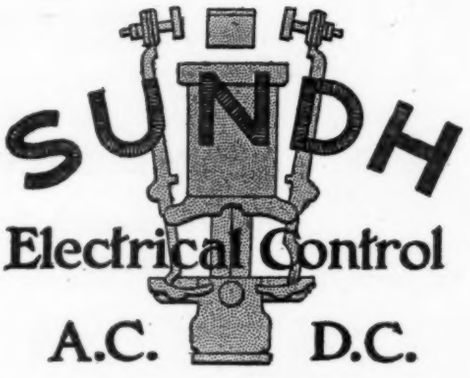

We also furnish the following standard devices:

Fire Pump Panel	Valve Control
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Circuit Breakers	Hand Starters
Remote Control Switches	Switches—Automatic and Hand
Liquid Level Indicator	Automatic Starter for A. C. and D. C.
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An interesting catalog fully descriptive of Sundh Controlling Devices sent on request. You'll find it helpful.

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New York

Chicago Office, H. J. Kaufman, Peoples Gas Building

AT LAST!

Attachment Plugs *Standardized!*

Six important Manufacturers of approved attachment plugs have united on a standard design similar to the

SPARTAN

Standard Line of

PLUGS & RECEPTACLES

BRYANT

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Littlebridge 91-372

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SIX-IN-ONE FUSE PLUG
SIMPLY PULL AND TURN - EVERY TURN A NEW FUSE
SAFE - ECONOMICAL - CONVENIENT
You Need Never be Without Light
A Quick, Safe Method that Restores Service Instantly when a Fuse "Blows"

When You Sell a Fuse Plug —Make 12 Cents

—and give your customer better service. Even in small quantities you can make 9 cents on each Fuse Plug sale.

Send for sample, descriptive literature and price list with discounts.

When a fuse blows any one can restore service or lights with the SIX-IN-ONE Fuse Plug.

A turn of the head of the fuse plug does it. The snap of the spring tells when the contact has moved on to another fuse. And there are six fuses in the fuse plug to take care of six interruptions of service from overload or short circuit.

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ATLAS SELLING AGENCY, Inc.

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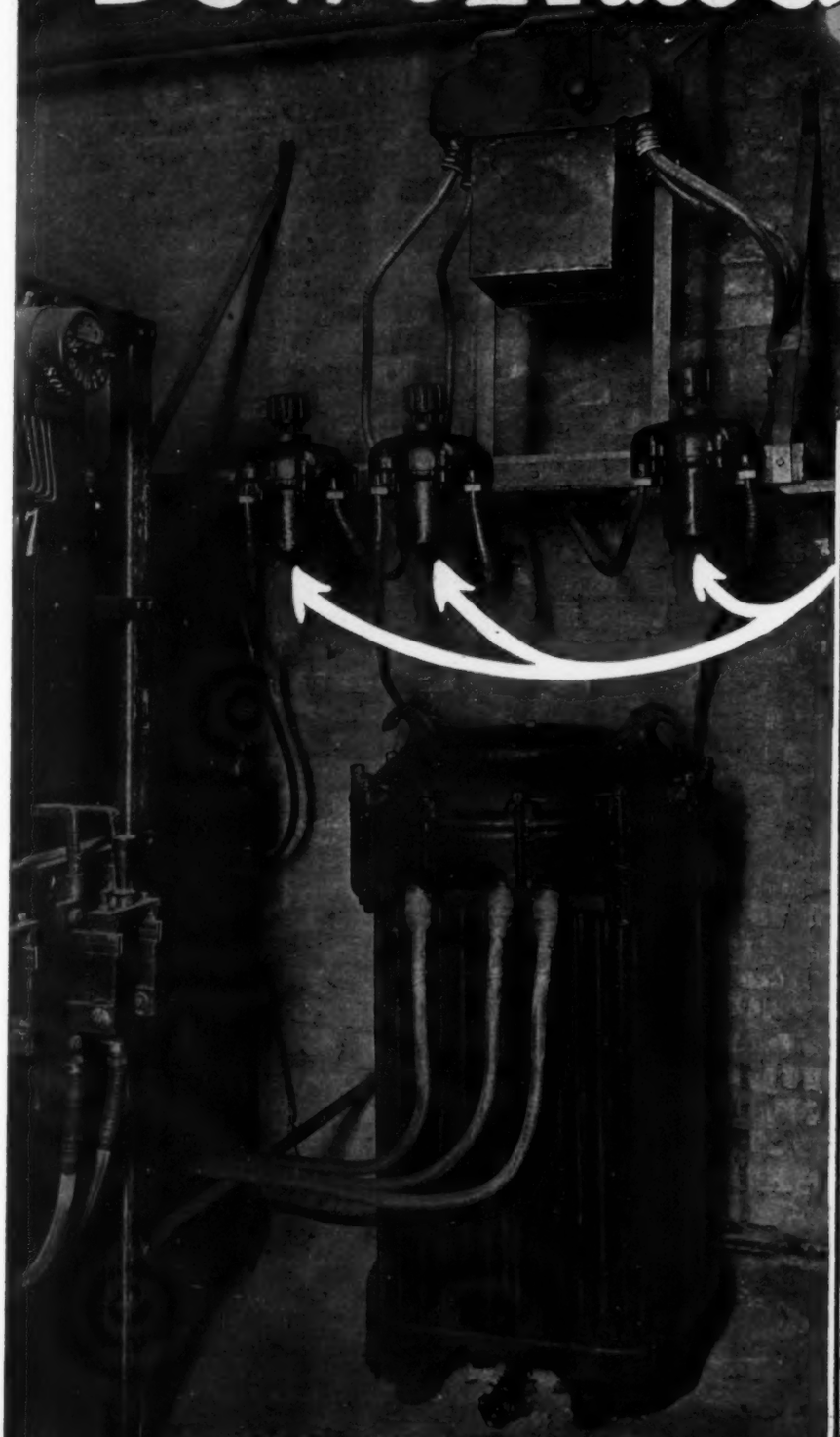
D&W Oil Fuse CutOuts



D & W Cutouts will carry your continuous load

D & W Cutouts will open your short circuits safely

D & W Cutouts operate quietly under all conditions

D & W Cutouts are renewable at extremely low costs.

D & W Cutouts protect the lineman as well as the lines

D & W Cutouts solve the high tension fuse problem.

For complete information let us send you the following circulars:
No. 150 Pole Type
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Your Products, too, will be of Better Quality, of Higher Efficiency, or will Cost Less

Many electrical manufacturers have found

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THE STANDARD MICA INSULATION
THE BEST IN MICA INSULATION
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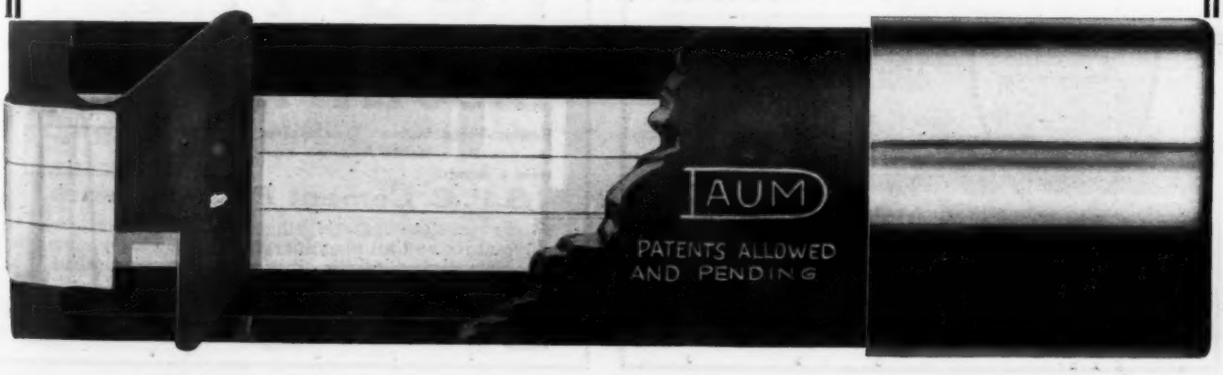

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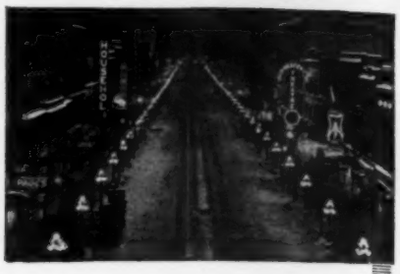

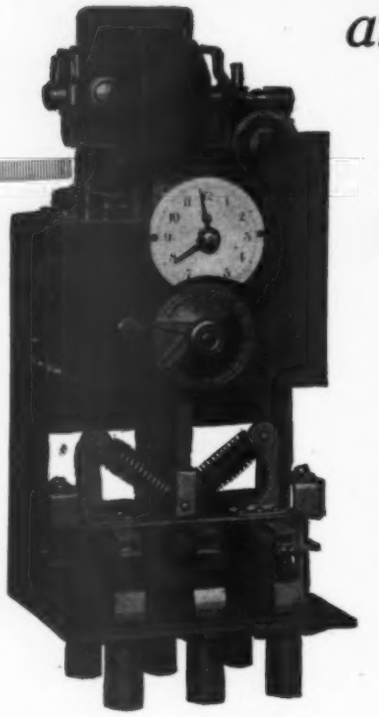

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These well built, dependable and electrically wound switches save many dollars in eliminating patrolling expense. No anxiety as to whether your circuits will go "on" and "off" when they should. Equipped with reliable clocks. Accuracy of the time element and positive operation of the switch always assured. Require no care—except oiling once in six months. Actual service tests prove they *cannot be stopped by extreme temperature changes!*
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Insulated Staples
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STAPLES best for wiring.
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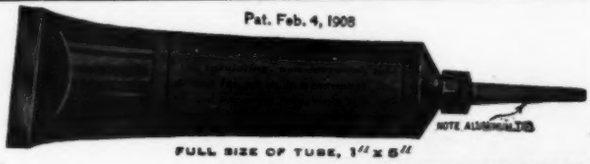

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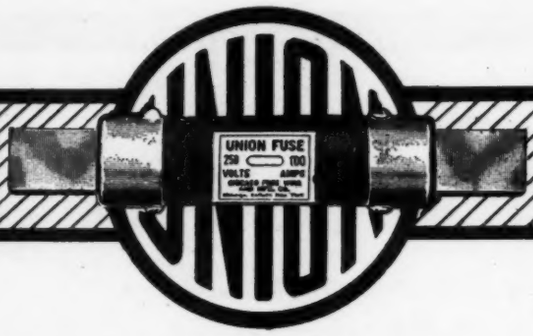

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The Best Insulation is PORCELAIN

The best Porcelain Tube is the **CALLENDER.** Provided with sharp edged projections which cut into the wood when the tubes are driven with a mallet, and prevent the tubes being pulled out of the holes when drawing wires, or from vibration of buildings.

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Flextube is made of an interwoven fibre cord and yarn fabric specially treated with moisture-proof and flame-proof compounds. No seams to break. Cannot be injured by crushing and kinking. Has smooth, canvas-like interior through which wires glide as though on roller bearings.

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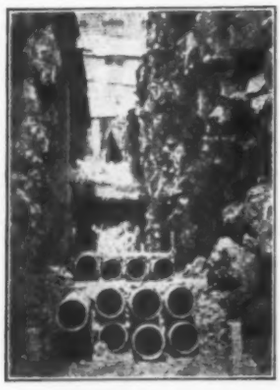

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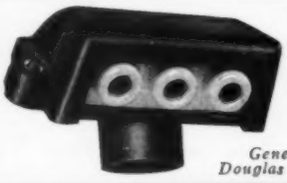

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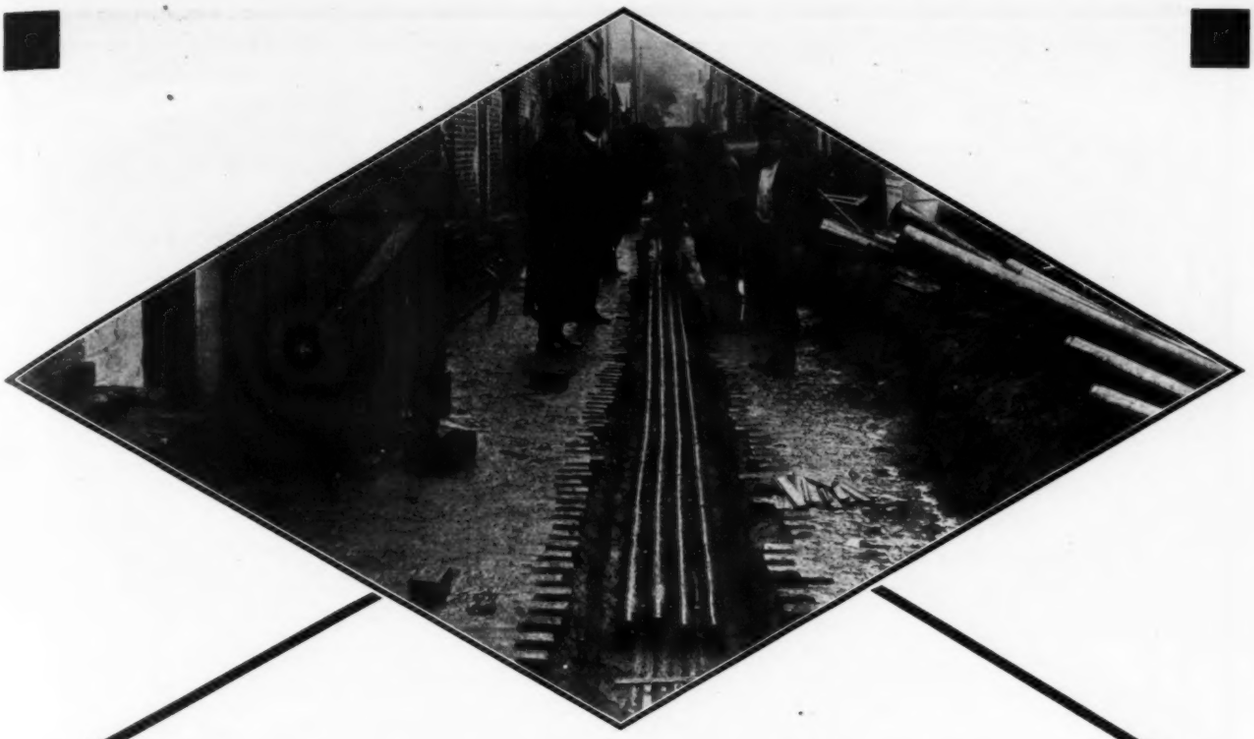

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For wiring old houses and similar work we recommend REALFLEX ARMORED CONDUCTOR. It is the newest and best of the type. It works easily, rapidly and without wastage. It is rat-proof and rust-proof, and goes anywhere a piece of rope would go.

Let us send you samples of these materials. It will cost you nothing, but will be worth money to you.

The Western Conduit Company

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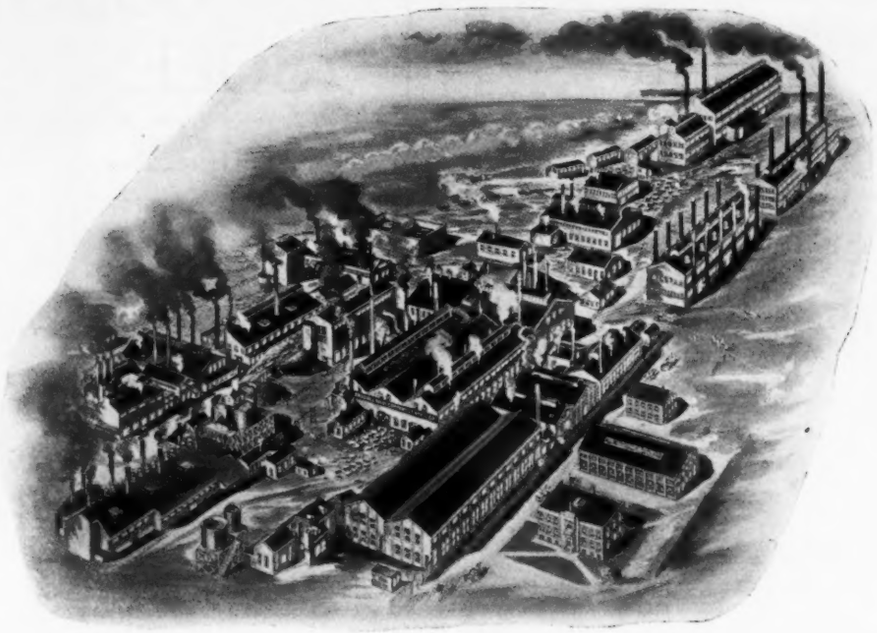
Youngstown, Ohio

CRUCIBLE STEEL



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to assure economical and reliable service.

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SPECIAL PORCELAINS

We have a most up-to-date factory and can assure customers

Satisfactory and Quick Service at the minimum of cost.

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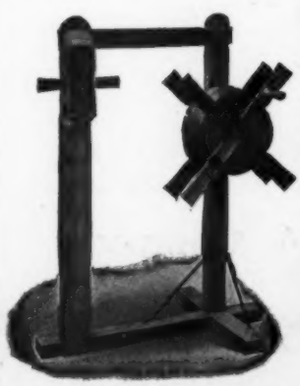


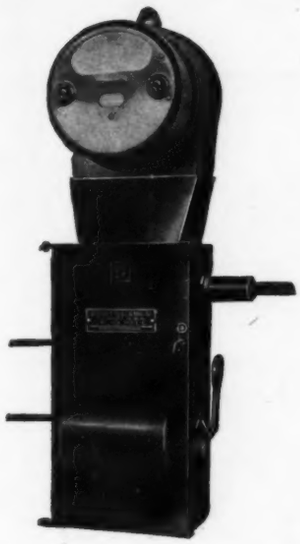
Wire Measuring Machine

A Great Convenience and Time Saver.

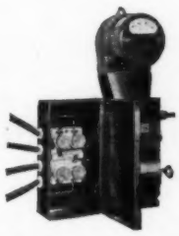
Reels Wire Into a Neat Coil and Shows Number of Feet.

Made by

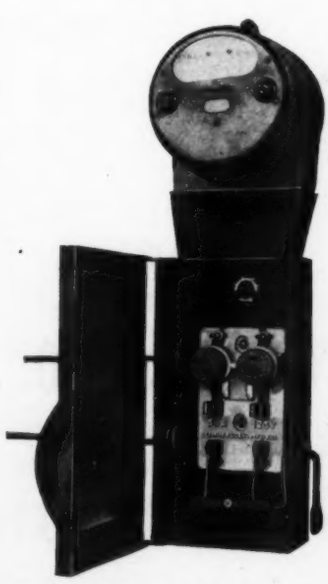
Minneapolis Electric and Construction Co.
Minneapolis, Minn.



Permanent Unit Installation "Square D" Steel Enclosed Service Switch with Meter Protective Trim



"Square D" Steel Enclosed Service Switch and Distributing Cabinet, with Meter Protective Trim



Cat. No. 8211E, Interior View "Square D" Steel Enclosed Service Switch with Meter Protective Trim

Service Entrance Installations *Not* Fully Protected Proved Costly Economy

During the past year many Central Stations and Service Corporations have installed "Square D" Steel Enclosed Service Switches with "Square D" Meter Protective Trim in order to completely control and protect the service entrance units on their lines.

"Square D" unit installations were made after a careful study of conditions proved to these companies that lack of complete control of their service was costly economy—piling up a big yearly loss in real profits.

By replacing the old accident and fire-hazard open knife switches with modern "Square D" unit installations they have been able to eliminate losses from over-fusing, improper fusing or no fusing at all, theft of current, accidents and fires. The "Square D" unit can also be made a permanent installation, which does away with removing and replacing the meter when service is disconnected or resumed—the patent "lock-off" feature inside the box makes this possible.

Consumers operate the switch "on" or "off" in perfect safety by a handle outside the box—if Central Stations so desire, the box may be sealed to prevent fuse tampering or accidental contact with live parts, yet not preventing operation of the switch.

Switch and cutout unit are installed complete in a sheet steel box having a hinged cover. Removable and interchangeable end plates are furnished in blanks, with knockouts or with porcelain outlet covers according to wiring requirements. Convenient knockouts in the sides provide for gang installations in apartment buildings and flats.

The "Square D" line also includes double compartment boxes in 30 Ampere, 125-250 Volt sizes, 2, 3 and 4 circuits, with switch in one side and branch cutouts in the other, separated by a sheet-steel partition.

The entire line of "Square D" Steel Enclosed Service Switches and Distributing Cabinets is approved by the Underwriters' Laboratories, and bears their official label. Send to-day for Bulletin 39-A, giving complete information and prices.

DETROIT FUSE & MFG. CO.

1415 Rivard Street

Detroit, Michigan

BRANCHES: New York, Chicago, Birmingham, Denver, San Francisco, Walkerville, Ont., and Toronto, Ont.

IF IT'S PARANITE IT'S RIGHT

That's the Reason Quality Jobbers Sell the Quality Wire—PARANITE

PARANITE Rubber-Covered Wires and Cables

Underground, Aerial, Submarine and Inside Use

TELEPHONE, TELEGRAPH AND FIRE ALARM CABLES, LAMP CORDS, PORTABLE CORDS AND IGNITION CABLES

INDIANA RUBBER & INSULATED WIRE CO.

Factory and General Offices: Jonesboro, Ind.

Chicago Branch: 210 Des Plaines St.
New York Branch: 105 Hudson St.

Quality Wire—That's PARANITE

ROEBLING

WIRE

¶ "Roebling" and "Wire" are inseparable in the minds of this country's most prominent engineers.

¶ The magnitude of the Roebling organization has been built on the merits of its wire products.

¶ Not the least of these is the wide line of electrical wire —bare and insulated.

¶ Every coil, reel or spool of Roebling wire is made under careful and skillful workmanship.

¶ The Roebling line of insulated wire includes: Magnet Wire, Office Wire, Weatherproof Wire, Rubber Covered Wire, Lamp Cord, Telephone Cables, Power Cables, and all other wires and cables used for electrical purposes.

John A. Roebling's Sons Company

Trenton, New Jersey

BRANCHES:

New York Boston Chicago Philadelphia Pittsburgh Cleveland
Atlanta San Francisco Los Angeles Seattle Portland, Ore.

Every coil examined and labeled under the direction of the underwriters laboratories. Ignition wire for autos, motor boats and aeroplanes. *Send for booklet fully describing.*

American Steel & Wire Company

Chicago New York Cleveland Pittsburgh Worcester Denver
Export Representative: U. S. Steel Products Co., New York
Pacific Coast Representative: U. S. Steel Products Co.
San Francisco Los Angeles Portland Seattle

...The...

National Conduit and Cable Co.

EXECUTIVE OFFICES
41 Park Row - - - New York, N. Y.

Manufacturers of
Bare Copper Wire and Cable
Weatherproof Wires and Cables
Paper Insulated Cables
For Power, Telephone and Telegraph

Boston Philadelphia Chicago San Francisco

MAGNET WIRE

MOORE MAGNET WIRE IS THE STANDARD OF EXCELLENCE

ALFRED F. MOORE

PHILADELPHIA

NEW YORK CLEVELAND CHICAGO BOSTON
CHATTANOOGA NEW ORLEANS

BELDEN

RUBBER COVERED WIRE

NECS
Duplex Solid

For Power, Lighting and Ignition
A dependable wire for every need

BELDEN MANUFACTURING CO.
2304 South Western Avenue Chicago

Show Window Cord Lamp Cord
LOWELL INSULATED WIRE CO.
Lowell, Mass.
N. E. C. S. Wire Telephone Wire

SEAMLESS RUBBER SAFETY INSULATIONS

SAFETY INSULATED WIRE & CABLE CO.
114 LIBERTY ST., NEW YORK
CHICAGO BOSTON
SAN FRANCISCO

FUSES
Arresters
Voltage Detectors

High Voltage Specialties

SCHWEITZER & CONRAD, Inc.
1770 Berteau Avenue
CHICAGO

JOHN G. ALDRICH, Pres. J. F. BLAUVELT, Agt. RUSSELL W. KNIGHT, Treas.

New England Butt Company

MANUFACTURERS OF

Machinery for Insulating Electrical Wires

Braiding, Taping, Winding, Twining, Cabling, Stranding, Polishing and Measuring Machines.

CABLE COVERING BRAIDERS FINE CASTINGS A SPECIALTY

304 Pearl Street, Providence, R. I., U. S. A.

DOLPHIN

INSULATED WIRE

Notable for its uniformly high quality and dependability.

Atlantic Insulated Wire and Cable Company

Sales Office: 120 Liberty Street, New York
Factory—Stamford, Conn.

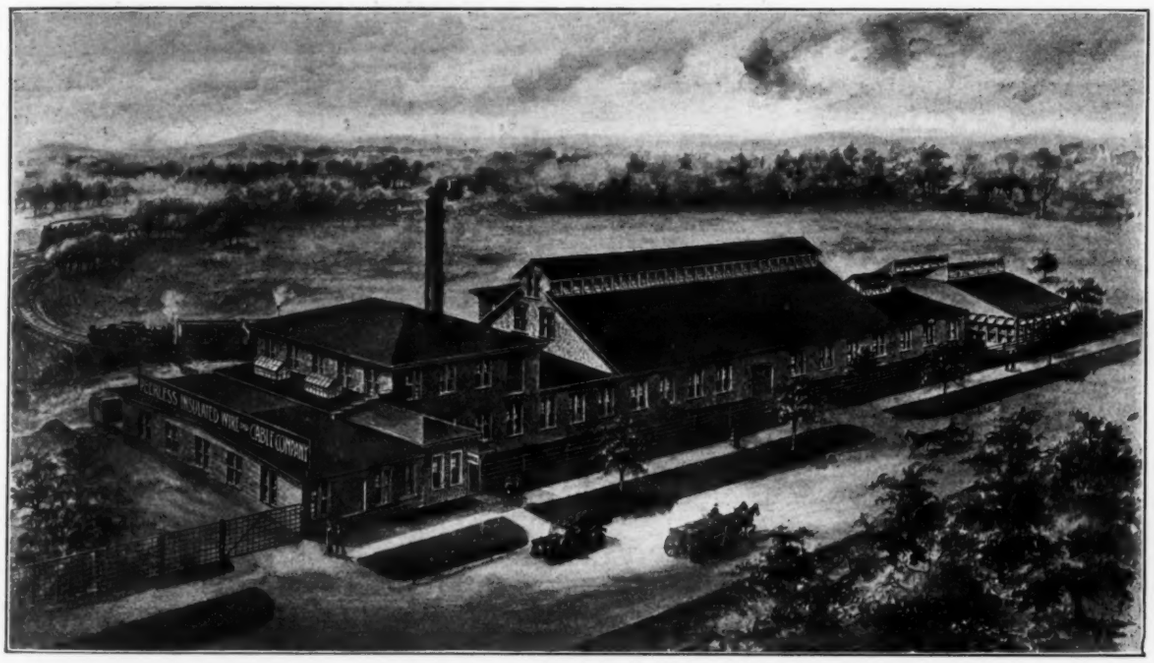
Commercial Code

Think of Peerless

PEERLESS PERFECT PROTECTION

Fibre-clad

When the Wire Must be Weatherproof



IT'S TOUGH
IT'S DURABLE
IT'S RELIABLE

Write for Descriptive Booklet

Peerless Insulated Wire & Cable Co.

Main Office, West St. Bldg., New York **Mills at Pennington, N. J.**

J. W. MORRISON, Prop.

Wholesalers of High Grade Northern and Western Cedar Poles

Inquiries receive prompt consideration; orders personal attention. Send us a list of the stock for which you are in the market. Shipping points convenient to any territory.

J. W. MORRISON LUMBER CO.
927-28 Lumber Exchange
Minneapolis, Minn.

Long White Cedar Poles
from
Wisconsin Forests
G. W. EVERTS LUMBER CO., Minneapolis, Minn.

DULUTH LOG COMPANY
POLE SERVICE
DULUTH MINNESOTA

The Brady Mast Arms
THE BRADY ELECTRIC MFG. CO., NEW BRITAIN, CONN., U. S. A.
Manufacturer of
MAST ARMS, POLE and SWITCHING HOODS, HOUSE BRACKETS and other specialties for construction work
Catalogue and Prices Furnished on Application

CEDAR POLES
Write for Prices. Prompt Shipments from Wisconsin or Chicago Switching District Yard on I. H. Belt R. R.
TORREY CEDAR CO., Clintonville, Wis.

WESTERN CEDAR POLES
Good Sound Stock
Prices Right
Write us.
HC Humbird Lumber Co. HC
Sandpoint ~ Idaho.

Electrical Exchange

Anything to sell?
Do you want help?
Do you require a position?

Make your wants (Electrical) known in the classified columns of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN. See page 116 of this issue.

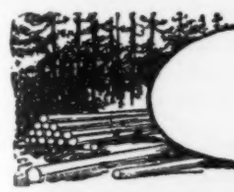
THE LINDSLEY BROTHERS COMPANY

Western **"Good Poles Quick"** Northern

Quick Shipments from our Minneapolis Yard

Minneapolis
Spokane - St. Louis

Butt Treating Open Tank and "Hot and Cold" Processes



CRAWFORD CEDAR CO.
MENOMINEE, MICH.
Northern Michigan White Cedar, Western Red Cedar
Woods Run POLES Butt Treated
Butts—Plain or Treated Quick Shipments

W. C. STERLING & SON CO.

POLES OF STERLING QUALITY
Oldest Cedar Pole Firm in Business Producers for 36 Years
MICHIGAN and WESTERN CEDAR
W. C. STERLING & SON COMPANY
1880 MONROE, MICHIGAN 1916

THE VALENTINE-CLARK CO.
CEDAR POLES Butt Treating Open Tank Process
MINNEAPOLIS, MINN.
Toledo Chicago St. Maries, Idaho

THE MAC GILLIS & GIBBS COMPANY MILWAUKEE --- WIS. ---
Immediate Shipment Guaranteed
YARDS — GLADSTONE, MICH. — DULUTH, MINN.
Shippers of "Quality" White Cedar Poles and Cross Ties

NAUGLE POLE & TIE CO. 2307 S. MORGAN ST. CHICAGO ILL.
The Trinity in Poles "Service-Price-Quality" **POLES**

CEDAR POLES
Wire or write for delivered prices
National Pole Co. Escanaba Mich

POLES WESTERN CEDAR **PILING**
We brag about the SERVICE we give
B. J. CARNEY & CO.
E. B. BRANDE, Manager 819 Broad Street, Grinnell, Ia.
M. P. FLANNERY, Manager 542 Peyton Bldg., Spokane, Wash
Commit us to memory

POLES
NORTHERN WHITE CEDAR WESTERN RED CEDAR
BUTT TREATING
PAGE & HILL CO.
MINNEAPOLIS, MINN.

NORTHERN-WESTERN
CEDAR POLES
A FULL ASSORTMENT OF SIZES
PROMPT SHIPMENTS ASSURED
T. M. PARTRIDGE LUMBER COMPANY
Lumber Exchange MINNEAPOLIS

We Ship Promptly
IDAHO CEDAR POLES
Sound in Quality, Right in Price.
Let Us Quote
Sandpoint Lumber & Pole Co., Ltd.
Sandpoint, Idaho

CEDAR POLES
NORTHERN SELECT WHITE SOUND STOCK
Get Our Quotations Regularly
WHEELER-ARNOLD CO. Wittenberg, Wis.

As Simple
to operate as a
MAZDA LAMP

What a Beauty!

exclaims every woman who sees it. That is one of the many reasons why it is easy to sell the

Acorn Electric Range

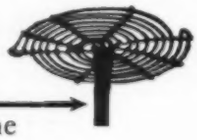
It is simple as a Mazda Lamp, almost as durable as pig iron and an ornament to any kitchen.

DOES NOT

SHORT CIRCUIT
SHOCK
OXIDIZE

Acorn Electrics are equipped with the new G-E Sheathed-Wire Heating Units.

An open coil of perfectly insulated wire, ***like this***, is embedded in the stove lid while it is being cast, making it one solid piece, like ***that***



Write for prices and new Catalog of 7 Acorn Models.

Rathbone Sard & Co.

Oldest American Stovemakers

Albany, N. Y.

Chicago Aurora Detroit

Henry Newgard & Co.

Electrical Engineers, Manufacturers and Contractors

We install power and lighting plants, generators and motors, and light and power wiring for all classes of buildings.

Upon this work we shall be glad to furnish estimates in any part of the United States and guarantee the lowest prices commensurate with the highest quality of work.

We are manufacturers of Switchboards, Panelboards, etc.

Newgard Receptacles and Waterproof Globes

One of our specialties. Made of non-corrosive material; will last for years in any climate and save many times original cost in economy of lamps and sockets.

Our new type "Newgard" will take 60 and 100 watt tungsten lamps.

Newgard Cut-out Boxes

fill all possible requirements and have many additional features which will interest buyers. They have not only been endorsed by the Underwriters, but are backed by personal guarantee.

Underwriters Stock Boxes appeal to every building contractor. A steady stream of testimonial letters as to their quality and service leads us confidently to assert that they are the best in the world.

Let us send you full particulars concerning any of our goods in which you may be interested.

We rewind any make of dynamo or motor, both alternating or direct. For quick service, write or telegraph us.

Henry Newgard & Co.

Chicago, Ill.

Branch—Milwaukee, Wis.

Gold Medal
San Francisco 1915
HUGHES
Acknowledged
World's Greatest
ELECTRIC
RANGES
Registered

"two birds"

You can kill two birds with one stone if you are a Convention delegate

Probably you represent one of the 2,000 Central Stations which contemplate the establishing of a cooking rate some time soon. And you have many things to learn and many little problems to solve before such a rate goes into effect.

The way to kill the "two birds" is to get all your cooking data while attending the Convention. A more apropos time and place never existed. You are in the city of the manufacturer who is best equipped to advise you, because of his great staff of cooking experts and range salesmen whose experience is unequalled—the manufacturer who makes 75 per cent of all the electric ranges sold!

So come to the Hughes Booth—Number 37—in the Auditorium Theatre and talk over the electric range proposition with the men who know—men who can offer real suggestions on the establishing of a rate, the inauguration of a campaign and sales policies and give you definite, valuable information on electric cooking in general. You are coming to electric cooking in your town—probably soon—because it is one of the biggest load builders of the Central Station. Why not go home prepared?

If you represent one of the 3,000 towns which now have a cooking rate and a range campaign, let us show you our new sales helps: catalogs, booklets, folders, movie slides and window displays.

You are welcome to make our booth your headquarters. Have your mail sent there. Moreover, we want you to come out and make a tour of the Hughes factory. There will be a private automobile service from the booth to the factory and return.

Be sure to be at the Booth Wednesday noon at 12 sharp! Some event! Miss Charlotte Greenwood, star of "So Long Letty," playing at the Olympic Theatre, will christen a new model Hughes Range—"Princess Off-Peak." Don't crowd! And please don't get in front of the movie men and the newspaper photographers. They want to kill "two birds" with one shot, too!

Hughes Electric Heating Company

211-233 West Schiller Street

Chicago

Canadian Factories: Toronto and Winnipeg

Fully Automatic Convenient—Economical

NO other line has complete automatic control, which permits the housewife to put the dinner in the oven and go away for the day, knowing that when she comes back the meal will be ready to serve.

No other line uses the fireless-cooker principle as efficiently and economically.

No other line offers such a variety of styles or such a broad price-range.

No other line produces as early a load—off-peak—because of its efficient fireless-cooker action.

And these by no means include all the exclusive Westinghouse features.

Time-Clock Control a Boon to the Housewife

Automatic control of Westinghouse ranges is obtained with a time-clock for turning on the current and thermostat for turning it off.

When the desired temperature is reached, a circuit breaker shuts off the current, and cooking is done by stored heat as in a fireless cooker. Ovens are heat-insulated with two inches of rock wool, while doors have compression latches to make them extra-tight fitting.

Cooking with stored heat is economical because no current is wasted.

It's cool because no heat escapes into the kitchen.

It's convenient because no one has to watch the oven, for the food can't burn.

It results in early, off-peak load

Westinghouse Electric Ranges

Electricity and Gas on the Same Range

That's what you get with any one of the new Westinghouse Combination Ranges—the latest exclusive feature to be added to a line already notable for distinctive improvements.

Electricity is used in the highly economical ovens, gas burners in the stove-tops where the heat must be applied continuously.

No other line of ranges has this exceptional selling advantage, which enables the demand for electric ranges to be met even where current rates are high, and opening the way to many more sales everywhere.

In the electric oven, meat, bread, cakes and pies can be evenly browned and food juices are not evaporated as in a gas oven. In roasting meats, no water is used, pans are not covered and "basting" is unnecessary.

The even distribution of heat and the flexibility of control thus obtained with Westinghouse ranges are unequalled—the large ovens have two heaters, at top and bottom, with three-heat switches.

82 Styles Built on 3 Models—Priced as Low as $35.00.

Three samples will enable you to show your prospects the complete line—two-oven and single-oven types, automatic and non-automatic, plain and nickel finish, straight electric and combination gas-and-electric.

Electric stove-top heaters are of the radiant or open-fire self-cleaning type, the coils being laid in a compound of moulded porcelain that will not check or crack and is impervious to water. Coils cannot "creep" and come in contact with cooking utensils. Heater beds are practically indestructible.

On the combination ranges there are four burners and simmer burner with an automatic gas-lighter which does away with matches.

The many mechanical advantages, the wide variety of styles, the support of an extensive advertising campaign, the prestige of the name "Westinghouse"—all these are yours when you sell Westinghouse Ranges.

Write for Catalog 8-D

Westinghouse Electric & Mfg. Co.

East Pittsburgh, Pa.

Branches in All Principal Cities

Westinghouse

Combination Ranges

MODERN HOME WASHER

MODERN HOME WASHER

Nothing Like It On The Market
Big Profits In Its Sale

A Cylinder-Type Washing Machine

Built either in its own portable tub or is built to fit in the stationary tubs which are in the average modern home. You can sell this stationary tub type where you could not sell a bulky portable machine.

Portable Type

Tested and Approved by Good Housekeeping Institute — Good Housekeeping Magazine

This is an Exclusive Agency Proposition and You Want It.

Good Housekeeping says it is all right and will wash clothes clean; that it is a well made machine; you have nothing to worry about on that score.

No belts or straps to stretch and give trouble. All machine cut gears. No cast gears. All gears run in oil.

The machines are being very extensively advertised. Advertising sells the goods. Do you want to reap some of the benefits of this?

Write us today for our plan, prices and special introductory offer. Don't wait until tomorrow. If you do the other fellow is likely to get in ahead of you.

Home Devices Corporation

Bush Terminal **Brooklyn, N. Y.**

MODERN HOME WASHER MODERN HOME WASHER MODERN HOME WASHER

Almost Unlimited Possibilities For The Increase of Current!

That is the money-making opportunity the Simplex Ironer offers to you, Commercial Managers of Central Stations. In large and small homes, hospitals, laundries, boarding houses, hotels, etc., this efficient machine supersedes the old, back-breaking methods, saves money for the owners—and produces 4 times as much work! You can see The—

SIMPLEX IRONER

At the Convention—Booth No. 56

Come in. See for yourself why The Simplex is the most extensively used ironing machine in America. And let us tell you about the **exceptional** campaign of Dealers Work that we do for Simplex boosters.

You will be surprised to learn how completely and **persistently** we have covered the advertising and selling situation from the Dealer's Standpoint. We feel that you will want to know **all** about Simplex Ironers. At least, come and get acquainted.—At the Convention—or at our general offices in The Federal Life Building, 168 N. Michigan Ave.

American Ironing Machine Co.

Chicago - - Illinois

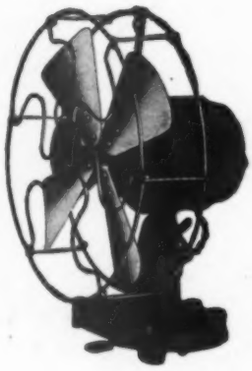
MAKER to JOBBER to DEALER

As good a combination as Tinker to Evers to Chance—the triple that got the money in the days of the old Cub machine

Peerless FANS

are built on honor, distributed only through jobbers, sold on guaranteed merit by dealers and contractors. 1916 sees the line strengthened by the addition of low-priced, quick selling leaders. Note these two:

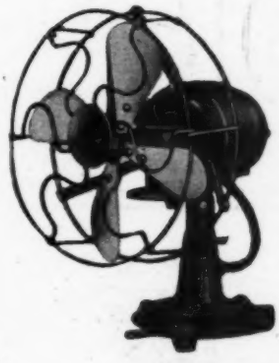
Peerless



MODEL PI. A full-sized eight-inch fan, sturdy, reliable, efficient and good-looking, at a low price. Sturdy cast frame, noiseless motor of the brush and commutator type, equipped with three-speed resistance, giving a variation from 1,400 minimum to 1,800 maximum speed. Instantly convertible from desk to bracket position by means of a single thumb-screw. Designed with a universal winding to run perfectly on either alternating or direct current with absolute quiet. A fan offering jobber and dealer every advantage from an electrical, a mechanical and a merchandizing standpoint at a low price.

MODEL OPI. The Peerless eight-inch D. C. and A. C. Oscillator, strictly up-to-date design and possessing all the features of the larger oscillators, is now available at a low price. Like Model PI, the oscillator may be converted instantly from desk to bracket position by adjusting one thumb-screw. A simple device throws the oscillating mechanism out of gear if stationary service is desired. Universal winding makes motor operate with like efficiency on D. C. and A. C. circuits. The frame is cast, the finish is high-grade black enamel, the guards and blades are solid brass, lacquered.

Peerless



Dealers and Contractors: Examine the full Peerless line in your jobber's display room. Get Catalogs and Bulletins, make note of the dealers' helps we furnish. Consider how handling Peerless fans simplifies the stock of fans required to meet the demands of your customers. Don't forget the profits and ***Be Sure to Make Your Drive on the Quick-Sellers—Peerless 8-inch Models PI and OPI.***

We Also Make:

Eight-inch Drawn Steel Induction Fan, desk and oscillating types.
Eight-inch Drawn Steel Direct Current Fan, desk and oscillating types.
Twelve and Sixteen-inch Direct Current Universal Desk and Bracket Fan.
Twelve and Sixteen-inch Direct Current Oscillating Fan.
Twelve and Sixteen-inch Alternating Current Universal Desk and Bracket Fan.
Twelve and Sixteen-inch Alternating Current Oscillating Fan.
Twelve-inch Alternating and Direct Current Six-Blade Residence Type Fan.
Direct Current Plain and Ornamental Ceiling Fans.
Direct and Alternating Current Ceiling Oscillating Fans.
Twelve to Twenty-four-inch Alternating Current Exhaust and Ventilating Fans.
Twelve to Forty-eight-inch Direct Current Exhaust and Ventilating Fans.

MOTORS GENERATORS ROTARY CONVERTERS

The Peerless Electric Company

Warren, Ohio

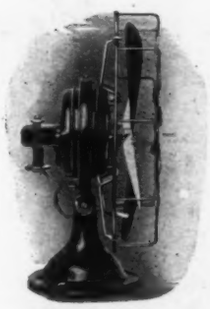
The Leading Jobber in Your City Stocks the Complete Peerless Line

$5.50 MENOMINEE $5.50

Leader for 1916

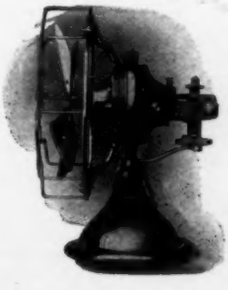
The Fan Buy of the Season. A full-sized 8-inch Universal Fan to retail at $5.50. Plug and 8 feet of cord included.

Big Sales Sure



The line begins with the popular 8-in. Universal to retail at $5.50. It is eleven inches high, weighs seven pounds, has cast iron body and base and a sturdy universal motor. Fully covered by the Menominee guarantee.

We are sole manufacturers of Table, Socket and 12-inch Universal Fans. The range of sizes in our standard types is complete. Our oscillators are especially noted for smooth, noiseless operation.



Be sure to get Menominee prices before placing orders elsewhere

MENOMINEE ELECTRIC MFG. CO.

MENOMINEE, MICH.

New York
Kandem Electric Co.
49 E. 21st St.

Chicago
33 So. Clinton St.

ORIGINATORS OF AUTOMATIC SWITCHLESS TELEPHONES
DE VEAU TELEPHONES

OKONITE
TRADE MARK REG. U.S. PAT. OFFICE
INSULATED WIRES AND CABLES

BERYLITE
TRADE MARK
GLASSWARE

DELTABESTON WIRE
REG. U.S. PAT. OFF.
MAGNET WIRE

PATTERSON BATTERY SETS

UNIVERSAL
HEATING APPLIANCES

COLUMBIA
MAZDA
INCANDESCENT LAMPS

WOOD SYSTEMS
FWEW
FORT WAYNE, IND.
ELECTRICAL APPARATUS

Central Electric Company
MAXOLITE
Chicago

1887

CENTRAL SPECIALTIES

indicate for themselves the quality and character of the merchandise we deliver at no greater price than others ask for inferior products.

Behind this quality is a comprehensive and dependable service which insures a prompt delivery and careful attention to your requirements.

Central Electric Company.

The House of Service

Chicago

OKONITE TRADE MARK REG U.S. PAT OFFICE

OKONITE TRADE MARK REG U.S. PAT OFFICE

CH
CON-DULETS

"Sirocco"
TRADE MARK
MOTOR DRIVEN BLOWERS

THE HOUSE OF SERVICE

THE IDEAL INDIRECT UNIT

Diehl TRADE MARK FANS ARE STANDARD

1916

Okonite Insulated Wire and Cables
Okonite Tape
Manson Tape
D & W Fuses
Ralco Plugs and Receptacles
G-E Wiring Devices

Maxolites
Alexalites
Berylite Glassware
Deltabeston Fixture Wire
Columbia Lamps

Central Ornamental Lamp Posts
Okonite Parkway Cable
Banner Brand Weatherproof Wire
G-E and Garton Daniels Arresters
D & W Oil-Fuse Cut-Outs
Dostal Dropout Disconnectors

G-E Electric Ranges
Universal Heating Devices

and a complete stock of Pole Line Hardware, Insulators, Cross Arms, Pins, Brackets, and all construction material for both inside and outside work.

Central Electric Company,

The House of Service

Chicago

MONOLUX DIRECT AND SEMI-INDIRECT LIGHTING UNITS

D&W FUSES

COLUMBIA DRY BATTERIES

G-E WIRING DEVICES

RALCO PLUGS AND RECEPTACLES

TRADE FARADAY MARK BELLS AND BUZZERS

QUALITY PELOUZE ELECTRIC HEATING DEVICES

Duncan A. C. Watthour Meter Model M 2

Never since the inception of the electric meter 'way back in the eighties, has there been such a demonstration of accuracy, stability and beauty of design as embodied in the Duncan Model M2 A. C. watthour meter. Even the most sanguine meter engineer of but five years ago would have been decidedly skeptical if asked whether or not the following data were possible of accomplishment—which figures, by the way, represent the facts as identified with the Duncan Model M2:

Series loss in watts	0.29
Potential loss in watts	1.0
Total full load loss in watts	1.29
Torque in millimeter-grammes	42.0
Weight of moving element in grammes	10.0
Ratio of torque to weight	4.2 to 1.0

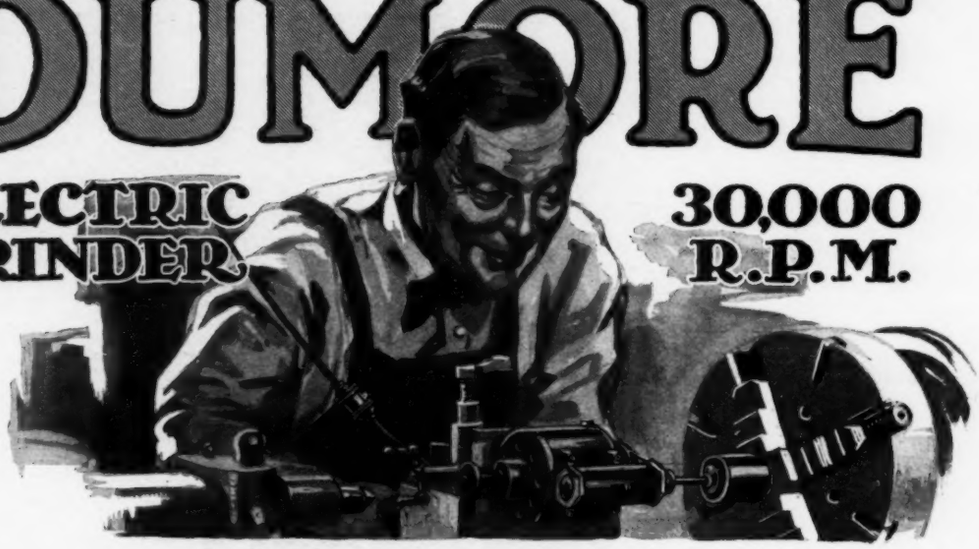
Runs continuously on ½ of 1% of full load.
Accurate to within ½ of 1% from 5% to 150% load.
Varies less than ½ of 1% for 10% change of voltage.
Varies less than ½ of 1% for 10% change of frequency.
Varies less than 1% for power factor of 50%.

Read these over carefully; study them; then, compare them with other meters. The Duncan, by every course of reasoning, is conceded to be the best meter extant.

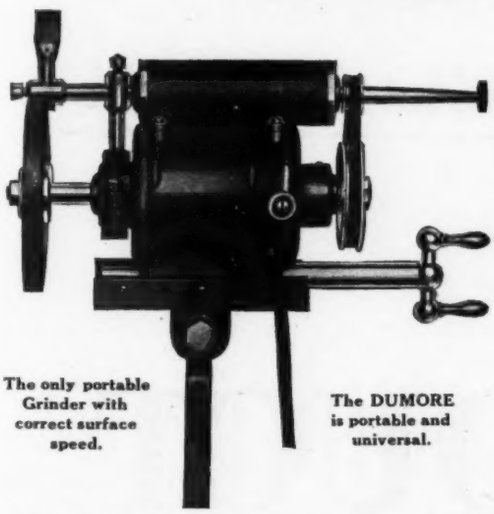
DUNCAN ELECTRIC MFG. COMPANY

Lafayette, Indiana

DUMORE



That's All You Need To Say To The Man Who Uses Grinders



The only portable Grinder with correct surface speed.

The DUMORE is portable and universal.

Then he will be interested. And when you tell him that the DUMORE Tool Post Grinder is designed by Ches. H. Beach, maker of the first successful Universal Motor; that the complete Grinder weighs only 17½ pounds; develops 1/6 H. P.; is dynamically balanced and carries a guarantee for durability and accuracy—then your prospect becomes a buyer.

There's a big demand for this Grinder. It is in use in many of the best known plants in the country. It will make customers and friends for you—liberal profits. Write us about the DUMORE Grinder.

The Dumore Sensitive Drill

S. K. F. bearings eliminate vibration.

This Drill is also dynamically balanced and is especially adapted for the use of jewelers, watch makers, instrument manufacturers and gold and silver smiths. The Feed Control which is equipped with a spring balance is extremely sensitive and the most delicate piece of work can be drilled accurately.

Drilling Capacity:

Steel—0 to 3-32" Brass, Aluminum and soft Alloys—0 to 13-64".

There is nothing better made for the purpose. The DUMORE Drill sells quickly. Liberal Profits.

Central Stations and Jobbers: A postcard will bring you valuable information about the DUMORE line and an interesting dealers' proposition.

Wisconsin Electric Co.

1404 Dumore Building
Racine, Wisconsin

Fishing is Fine

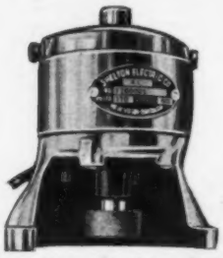
With

DURADUCT

(Reg. U. S. Patent Office)

THAT'S ALL

Portable Hand Massage Vibrator. Weighs but 18 oz. Strong and reliable motor.



Electric Phonograph Motor. A marvel of efficiency and precision. Variable speed, 800 to 2,000 R. P. M. No attachment or wiring required; no interference with spring-driven mechanism except unwinding crank handle. Patented. Infringers will be vigorously prosecuted.

Shelton Dental Engine. A triumph in small motor construction. Weighs but 5 oz. Any standard hand piece may be attached. Will do the hardest kind of grinding or drilling without stalling. Special circular on request.

Pedestal Hair Dryer. Throws a large volume of hot or cold air in any direction.

SHELTON

The unique line of electrically operated instruments, driven by the world's most efficient small motors, includes:

Vibrators Massage Machines
Dental Engines Centrifuges
Drink Mixers Hair Dryers
High Frequency Generators
Electric Phonograph Motors

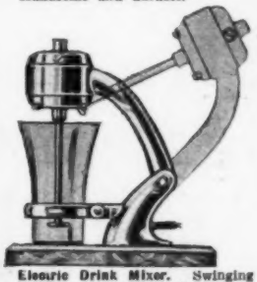
Simplicity and lightness, with durability, have made the Shelton instruments leaders. Always ready for service, easily adjusted while in motion, and covered by the Shelton guarantee, dealers find the line pleasant and profitable to handle.

The sales helps we put out are strong factors in Shelton popularity. Advertising matter is furnished; complete directions for use accompany each machine.

Write for Catalog with Prices, Discounts, Special Literature, Etc.

Ideal Pedestal Massage Machine. Regulated, started and stopped by pushing a button. Any form of vibratory treatment may be given. Handsome and durable.

Portable Hair Dryer. Over 36,000 in use. Hot or cold air. Guaranteed in every way.



Electric Drink Mixer. Swinging bracket operates the switch. Very popular, affording a quick, clean, thorough means of mixing drinks.

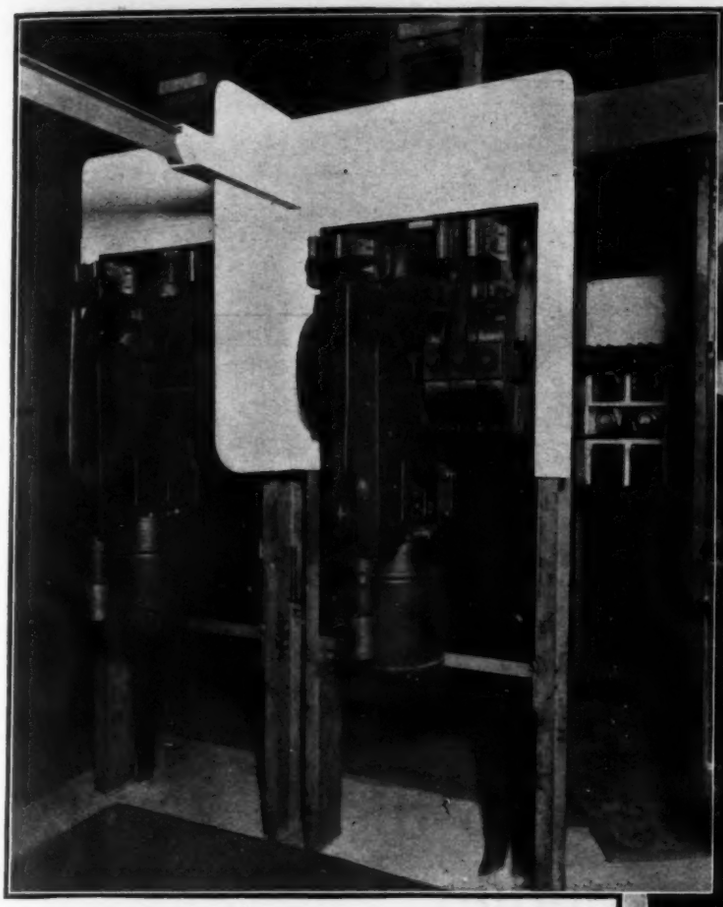
"Special" Portable Vibrator. Weighs 29 oz. Universal motor. Complete with six applicators in case.

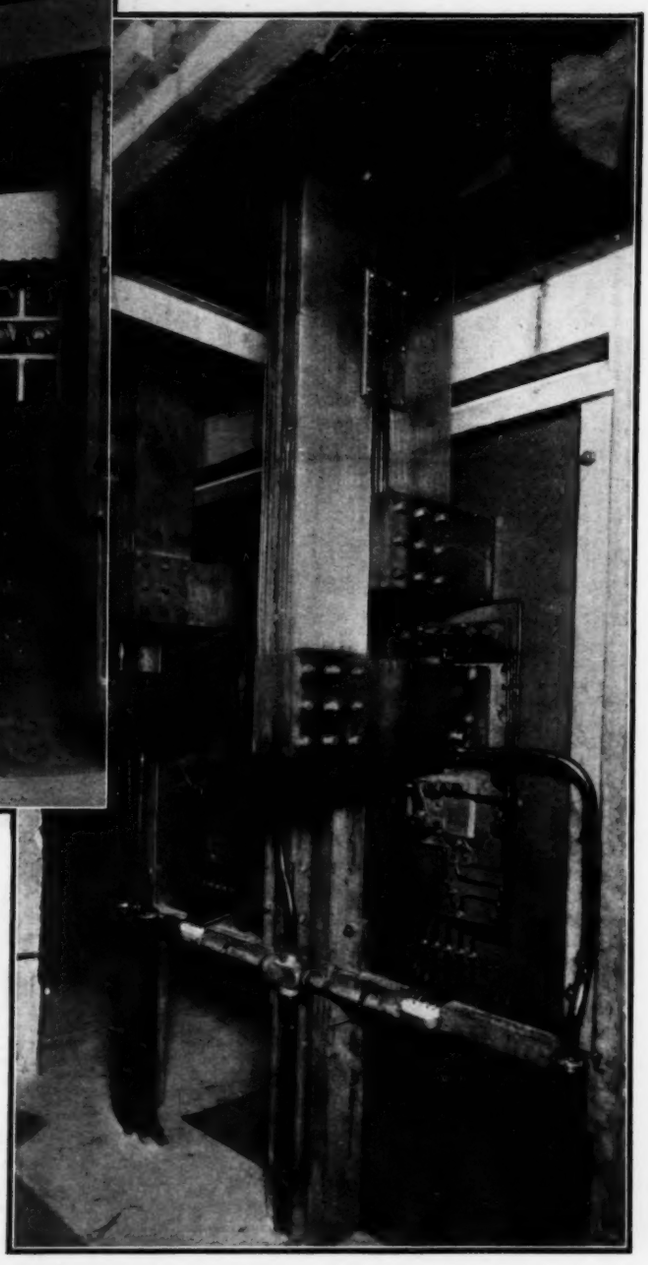
High Frequency Generator. Ready sale to high class beauty parlors, barber-shops, doctors, for scalp and skin treatments. Wide range of adjustment.

SHELTON ELECTRIC COMPANY

New York 30 East Forty-Second Street
Chicago 30 East Randolph Street
Boston 101 Trenton Street
San Francisco 62 Post Street

Factory: Fort Wayne, Indiana, U. S. A.





The World's Biggest Circuit Breakers

are rounding out their second year of successful service in the Sherman Street Sub-Station of the Commonwealth-Edison Co., Chicago.

ANDERSON Type C, 20,000 Amperes

With overload and reverse current release

Inspect these largest of all circuit-breakers during N. E. L. A. Convention week. They open under excess load and on reverse current automatically. They may be opened or closed by an operator throwing a small switch located on a control board overlooking the rotaries.

Another set of Anderson Circuit-Breakers of 14,000 amperes capacity may be seen in this substation. We are prepared to build this type of breaker to carry 25,000 amperes and higher. **See our exhibit at N. E. L. A. Convention.**

Albert & J. M. Anderson Mfg. Co.

289-293 A Street, BOSTON, MASS., U. S. A.

BRANCHES:

NEW YORK, 135 Broadway CHICAGO, 105 S. Dearborn St. PHILADELPHIA, 429 Real Estate Trust Bldg.
SAN FRANCISCO, 613 Postal Telegraph Bldg. LONDON, E. C., 48 Milton Street

AETNA

"A Sign of Excellence"

INVITATION

Delegates and Visitors to the N. E. L. A. Convention

We cordially invite you to examine "EEE" products where they are made. We believe your visit to our plant will more than repay you for the hour devoted to this purpose.

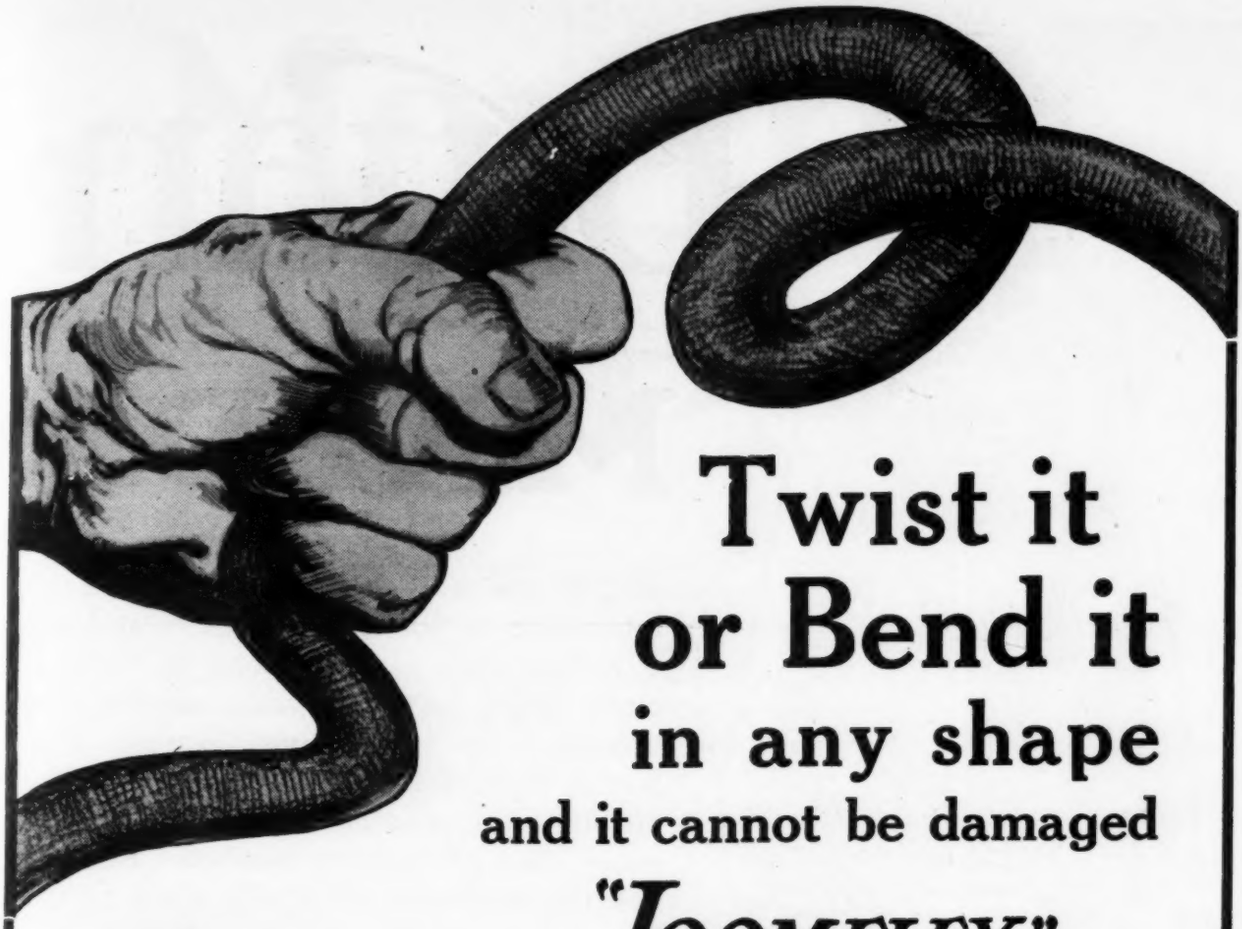
"A Sign of Excellence"

ELECTRICAL ENGINEERS EQUIPMENT CO.

711-717 Meridian St.
CHICAGO

Madison Street West to Union and a short block North to Meridian Street

"A Sign of Excellence"



Twist it or Bend it in any shape and it cannot be damaged

"LOOMFLEX" *Flexible Conduit*

Will Stand Abuse on the Job

Practically indestructible by any mechanical agency. No matter how badly crushed, "LOOMFLEX" can readily be pinched back into shape. Its extreme flexibility allows it to be worked without trouble in hard places. Every foot can be used. Fishing wires through the smooth raceway of "LOOMFLEX" is a snap. Get a sample for proof.

Look for the Red Bands on Coils

Lots of room for the wire.

Size 7/32" easily takes No. 14 wire for ordinary runs and No. 12 for short runs.

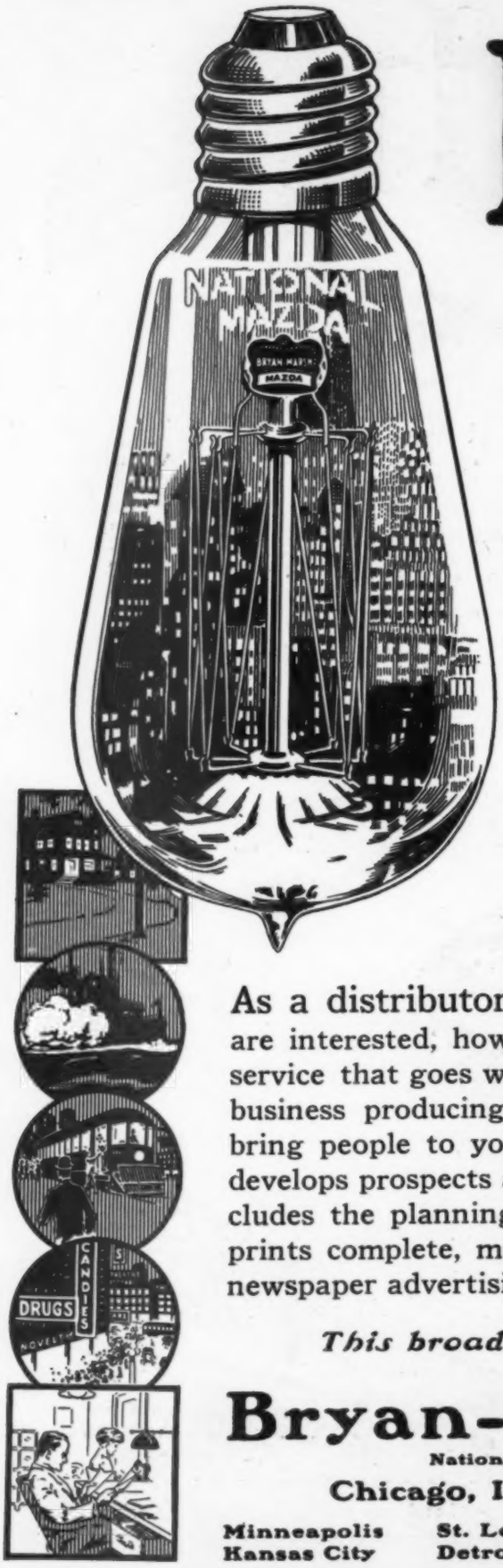
All sizes have extra large inside diameter. Samples on request.

AMERICAN CIRCULAR LOOM CO. TRADE MARK

American Circular Loom Co.

90 West Street, New York

Boston Chicago Los Angeles San Francisco Seattle Toronto



Bryan MAZDA

Bryan-Marsh Mazda Lamps fill a multitude of sockets. Night in and night out, year after year, millions of these efficient lamps are supplying candle-power economically to homes, stores, offices, hotels, factories, streets, trains, street cars, automobiles, electric signs,—in fact, for every class of lighting service. Each succeeding year sees more and more of these lamps in use. This continued and unlimited use of Bryan-Marsh Mazdas is in itself indisputable evidence that they give satisfaction.

As a distributor of Bryan-Marsh Mazda Lamps you are interested, however, not in lamp quality alone, but in the service that goes with it. Bryan-Marsh service is live, creative, business producing service—the constructive kind that helps bring people to your counter, broadens your field of influence, develops prospects and moves the stock off your shelves. It includes the planning of lighting installations, submitting blueprints complete, material for window trims, cuts and copy for newspaper advertising, pamphlets, folders, etc.

This broad service is yours by addressing

Bryan-Marsh Division

National Lamp Works of General Electric Co.

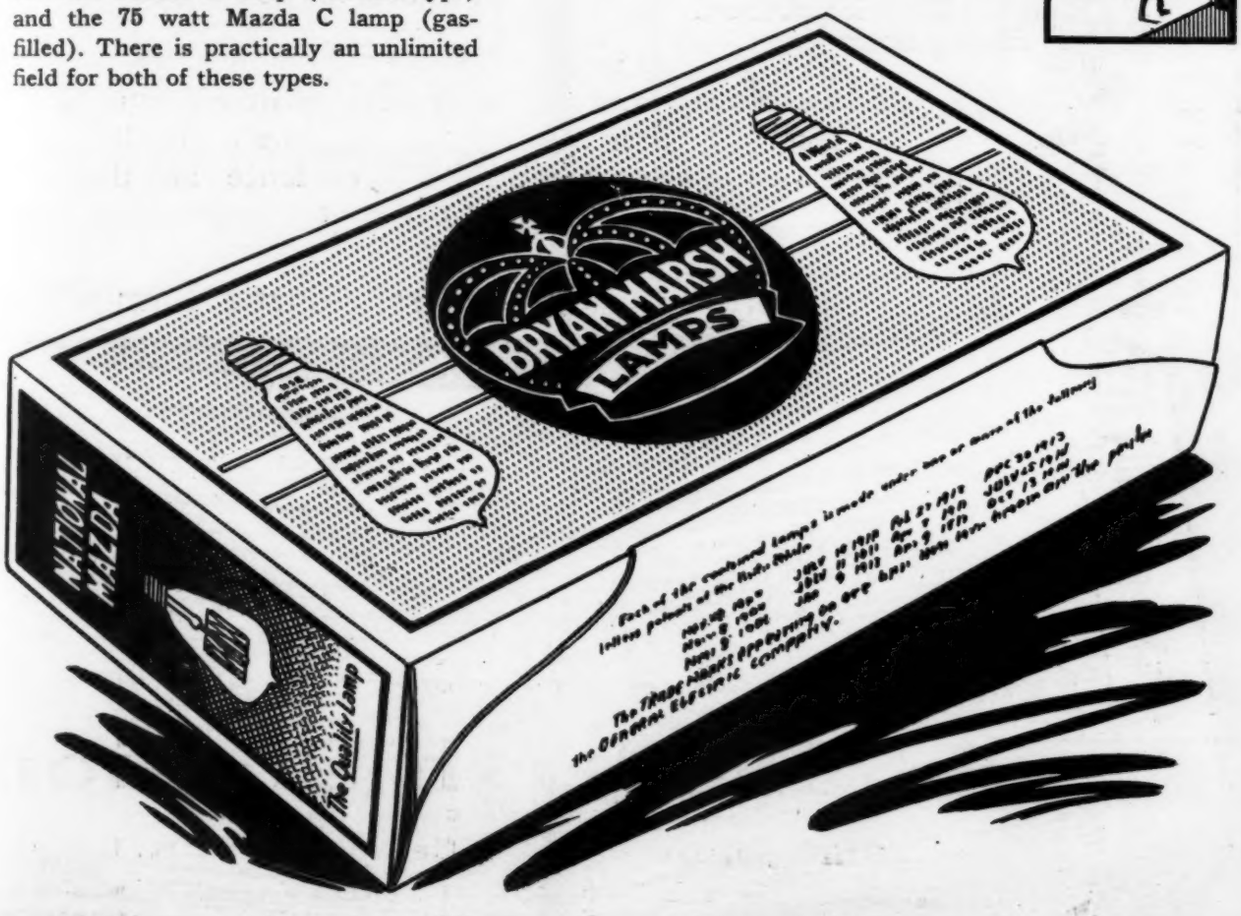
Chicago, Ill. **Central Falls, R. I.**

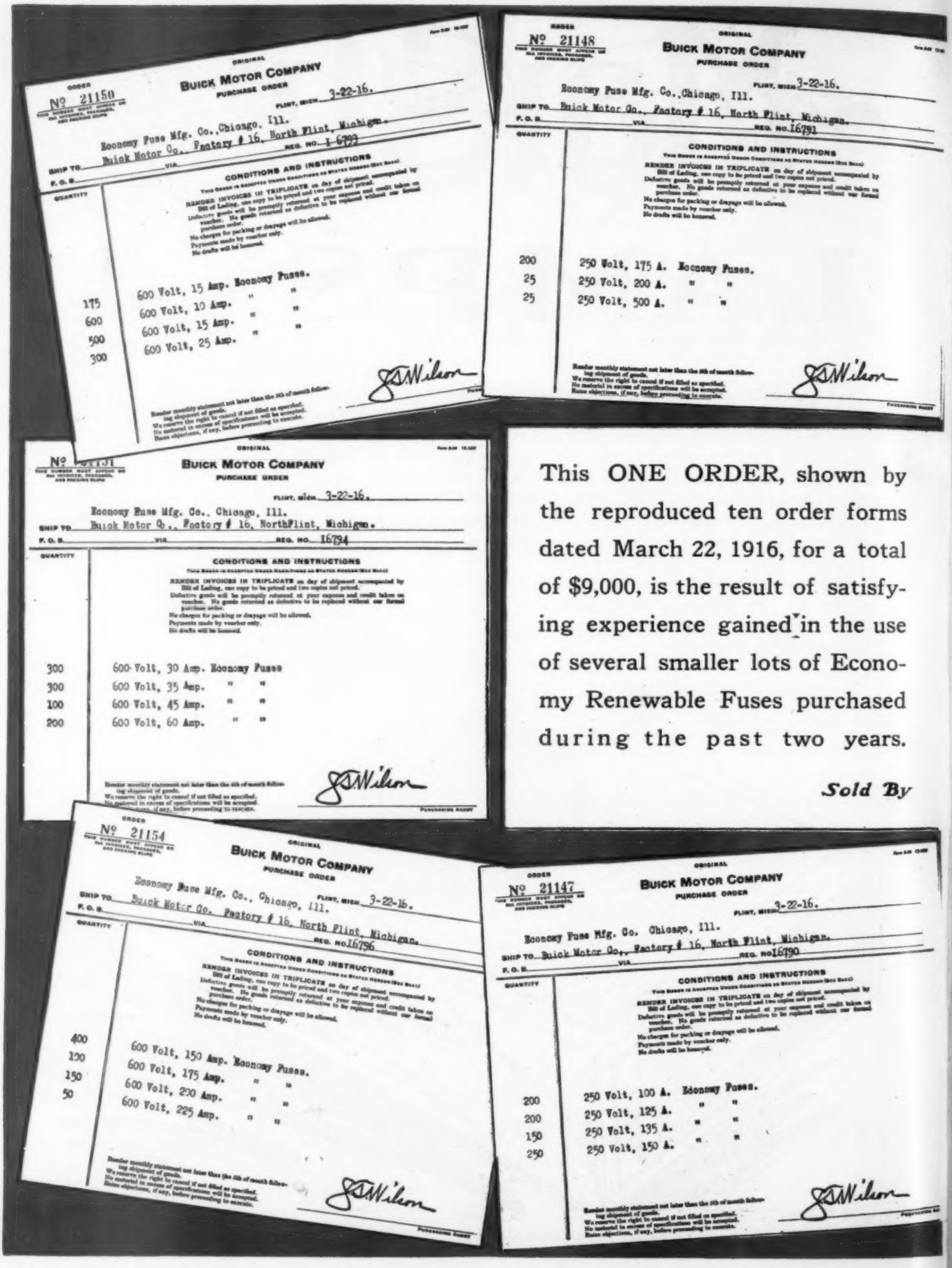
Minneapolis **St. Louis** **Denver** **Los Angeles** **New York**
Kansas City **Detroit** **New Orleans** **Seattle** **Oakland**

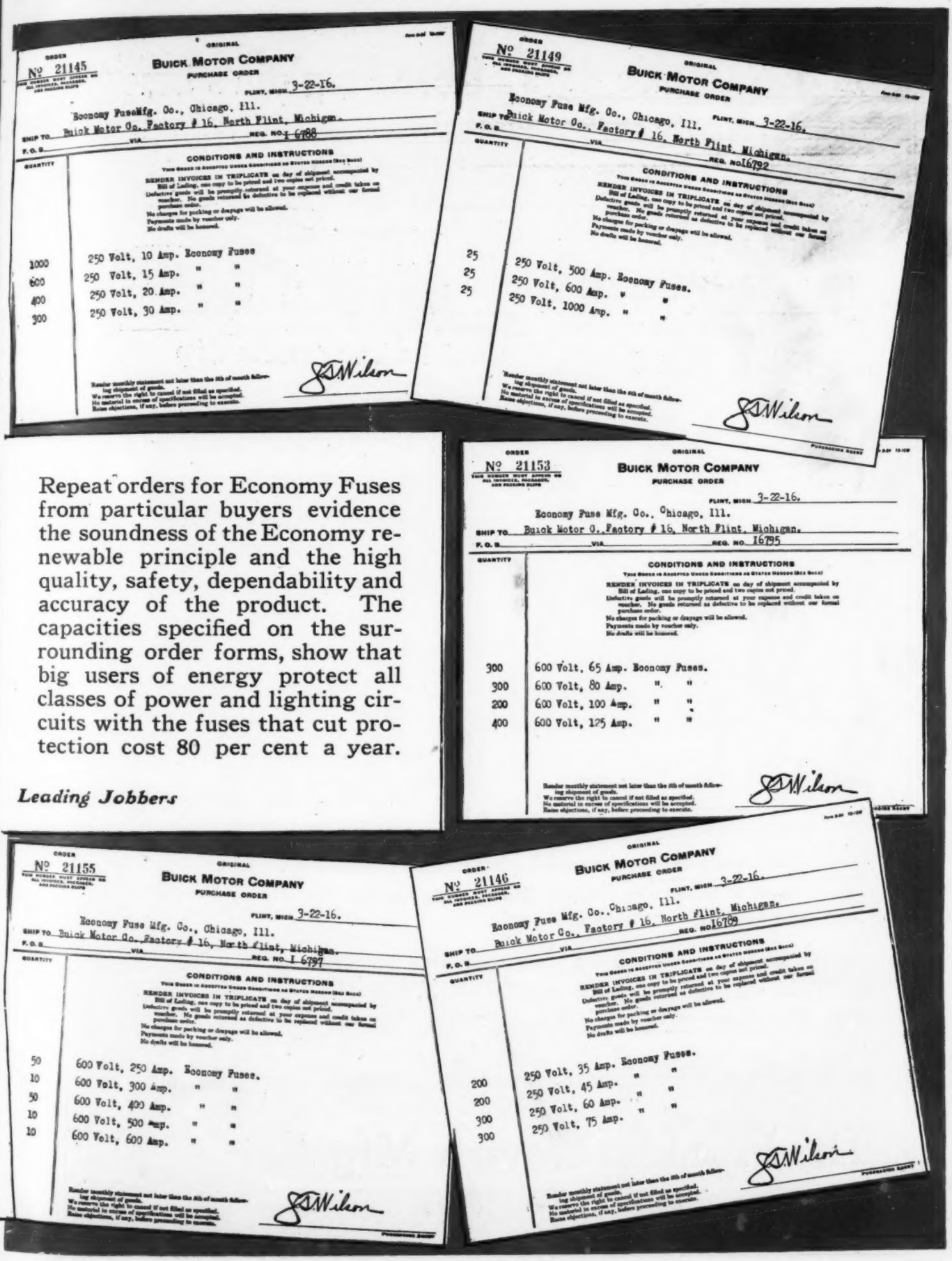
~Marsh LAMPS

The high quality of Bryan-Marsh Mazda lamps is due to selected raw materials, to skilled workmanship, to the rigid maintenance of a thorough test and inspection system and to improvements and refinements that are continually being worked out. The factories in which Bryan-Marsh lamps are made have access to all scientific research and development activities carried on in the principal lamp laboratories in this country and abroad. This is a guaranty that Bryan-Marsh Mazda lamps will always embody the most recent advances in the art of incandescent electric lamp manufacture.

The two latest developments are the 50 watt Mazda B lamp (vacuum type) and the 75 watt Mazda C lamp (gas-filled). There is practically an unlimited field for both of these types.




ORIGINAL
ORDER
No 21150
BUICK MOTOR COMPANY
PURCHASE ORDER
FLINT, MICH. 3-22-16.
Economy Fuse Mfg. Co., Chicago, Ill.
SHIP TO Buick Motor Co., Factory # 16, North Flint, Michigan.
F. O. B. VIA REG. NO. 16793
QUANTITY
CONDITIONS AND INSTRUCTIONS
RENDER INVOICES IN TRIPLICATE on day of shipment accompanied by Bill of Lading, one copy to be priced and two copies not priced.
Defective goods will be promptly returned at your expense and credit taken on voucher. No goods returned as defective to be replaced without our formal purchase order.
No charges for packing or drayage will be allowed.
Payments made by voucher only.
No drafts will be honored.
175 600 Volt, 15 Amp. Economy Fuses.
600 600 Volt, 10 Amp. " "
500 600 Volt, 15 Amp. " "
300 600 Volt, 25 Amp. " "
Render monthly statement not later than the 5th of month following shipment of goods.
We reserve the right to cancel if not filled as specified.
No material in excess of specifications will be accepted.
Raise objections, if any, before proceeding to execute.
J. S. Wilson
Purchasing Agent
ORIGINAL
ORDER
No 21148
BUICK MOTOR COMPANY
PURCHASE ORDER
FLINT, MICH. 3-22-16.
Economy Fuse Mfg. Co., Chicago, Ill.
SHIP TO Buick Motor Co., Factory # 16, North Flint, Michigan.
F. O. B. VIA REG. NO 16791
QUANTITY
CONDITIONS AND INSTRUCTIONS
RENDER INVOICES IN TRIPLICATE on day of shipment accompanied by Bill of Lading, one copy to be priced and two copies not priced.
Defective goods will be promptly returned at your expense and credit taken on voucher. No goods returned as defective to be replaced without our formal purchase order.
No charges for packing or drayage will be allowed.
Payments made by voucher only.
No drafts will be honored.
200 250 Volt, 175 A. Economy Fuses.
25 250 Volt, 200 A. " "
25 250 Volt, 500 A. " "
Render monthly statement not later than the 5th of month following shipment of goods.
We reserve the right to cancel if not filled as specified.
No material in excess of specifications will be accepted.
Raise objections, if any, before proceeding to execute.
J. S. Wilson
Purchasing Agent
ORIGINAL
No 21151
BUICK MOTOR COMPANY
PURCHASE ORDER
FLINT, MICH. 3-22-16.
Economy Fuse Mfg. Co., Chicago, Ill.
SHIP TO Buick Motor Co., Factory # 16, North Flint, Michigan.
F. O. B. VIA REG. NO. 16794
QUANTITY
CONDITIONS AND INSTRUCTIONS
RENDER INVOICES IN TRIPLICATE on day of shipment accompanied by Bill of Lading, one copy to be priced and two copies not priced.
Defective goods will be promptly returned at your expense and credit taken on voucher. No goods returned as defective to be replaced without our formal purchase order.
No charges for packing or drayage will be allowed.
Payments made by voucher only.
No drafts will be honored.
300 600 Volt, 30 Amp. Economy Fuses
300 600 Volt, 35 Amp. " "
100 600 Volt, 45 Amp. " "
200 600 Volt, 60 Amp. " "
Render monthly statement not later than the 5th of month following shipment of goods.
We reserve the right to cancel if not filled as specified.
No material in excess of specifications will be accepted.
Raise objections, if any, before proceeding to execute.
J. S. Wilson
Purchasing Agent
This ONE ORDER, shown by the reproduced ten order forms dated March 22, 1916, for a total of $9,000, is the result of satisfying experience gained in the use of several smaller lots of Economy Renewable Fuses purchased during the past two years.
Sold By
ORIGINAL
ORDER
No 21154
BUICK MOTOR COMPANY
PURCHASE ORDER
FLINT, MICH. 3-22-16.
Economy Fuse Mfg. Co., Chicago, Ill.
SHIP TO Buick Motor Co., Factory # 16, North Flint, Michigan.
F. O. B. VIA REG. NO 16796
QUANTITY
CONDITIONS AND INSTRUCTIONS
RENDER INVOICES IN TRIPLICATE on day of shipment accompanied by Bill of Lading, one copy to be priced and two copies not priced.
Defective goods will be promptly returned at your expense and credit taken on voucher. No goods returned as defective to be replaced without our formal purchase order.
No charges for packing or drayage will be allowed.
Payments made by voucher only.
No drafts will be honored.
400 600 Volt, 150 Amp. Economy Fuses.
100 600 Volt, 175 Amp. " "
150 600 Volt, 200 Amp. " "
50 600 Volt, 225 Amp. " "
Render monthly statement not later than the 5th of month following shipment of goods.
We reserve the right to cancel if not filled as specified.
No material in excess of specifications will be accepted.
Raise objections, if any, before proceeding to execute.
J. S. Wilson
Purchasing Agent
ORIGINAL
ORDER
No 21147
BUICK MOTOR COMPANY
PURCHASE ORDER
FLINT, MICH. 3-22-16.
Economy Fuse Mfg. Co. Chicago, Ill.
SHIP TO Buick Motor Co., Factory # 16, North Flint, Michigan.
F. O. B. VIA REG. NO 16790
QUANTITY
CONDITIONS AND INSTRUCTIONS
RENDER INVOICES IN TRIPLICATE on day of shipment accompanied by Bill of Lading, one copy to be priced and two copies not priced.
Defective goods will be promptly returned at your expense and credit taken on voucher. No goods returned as defective to be replaced without our formal purchase order.
No charges for packing or drayage will be allowed.
Payments made by voucher only.
No drafts will be honored.
200 250 Volt, 100 A. Economy Fuses.
200 250 Volt, 125 A. " "
150 250 Volt, 135 A. " "
250 250 Volt, 150 A. " "
Render monthly statement not later than the 5th of month following shipment of goods.
We reserve the right to cancel if not filled as specified.
No material in excess of specifications will be accepted.
Raise objections, if any, before proceeding to execute.
J. S. Wilson
Purchasing Agent


ORDER
No 21145
BUICK MOTOR COMPANY
PURCHASE ORDER
FLINT, MICH. 3-22-16.
Economy FuseMfg. Co., Chicago, Ill.
SHIP TO Buick Motor Co. Factory # 16, North Flint, Michigan.
F. O. B. VIA REQ. NO. I 6788
QUANTITY
CONDITIONS AND INSTRUCTIONS
RENDER INVOICES IN TRIPLICATE on day of shipment accompanied by Bill of Lading, one copy to be priced and two copies not priced.
Defective goods will be promptly returned at your expense and credit taken on voucher. No goods returned as defective to be replaced without our formal purchase order.
No charges for packing or drayage will be allowed.
Payments made by voucher only.
No drafts will be honored.
1000 250 Volt, 10 Amp. Economy Fuses
600 250 Volt, 15 Amp. " "
400 250 Volt, 20 Amp. " "
300 250 Volt, 30 Amp. " "
Render monthly statement not later than the 5th of month following shipment of goods.
We reserve the right to cancel if not filled as specified.
No material in excess of specifications will be accepted.
Raise objections, if any, before proceeding to execute.
J. S. Wilson
ORDER
No 21149
BUICK MOTOR COMPANY
PURCHASE ORDER
Economy Fuse Mfg. Co., Chicago, Ill.
FLINT, MICH. 3-22-16.
SHIP TO Buick Motor Co., Factory # 16, North Flint, Michigan.
F. O. B. VIA REQ. NO. 16792
QUANTITY
CONDITIONS AND INSTRUCTIONS
RENDER INVOICES IN TRIPLICATE on day of shipment accompanied by Bill of Lading, one copy to be priced and two copies not priced.
Defective goods will be promptly returned at your expense and credit taken on voucher. No goods returned as defective to be replaced without our formal purchase order.
No charges for packing or drayage will be allowed.
Payments made by voucher only.
No drafts will be honored.
25 250 Volt, 500 Amp. Economy Fuses.
25 250 Volt, 600 Amp. " "
25 250 Volt, 1000 Amp. " "
Render monthly statement not later than the 5th of month following shipment of goods.
We reserve the right to cancel if not filled as specified.
No material in excess of specifications will be accepted.
Raise objections, if any, before proceeding to execute.
J. S. Wilson
ORDER
No 21153
BUICK MOTOR COMPANY
PURCHASE ORDER
FLINT, MICH. 3-22-16.
Economy Fuse Mfg. Co., Chicago, Ill.
SHIP TO Buick Motor C., Factory # 16, North Flint, Michigan.
F. O. B. VIA REQ. NO. 16795
QUANTITY
CONDITIONS AND INSTRUCTIONS
RENDER INVOICES IN TRIPLICATE on day of shipment accompanied by Bill of Lading, one copy to be priced and two copies not priced.
Defective goods will be promptly returned at your expense and credit taken on voucher. No goods returned as defective to be replaced without our formal purchase order.
No charges for packing or drayage will be allowed.
Payments made by voucher only.
No drafts will be honored.
300 600 Volt, 65 Amp. Economy Fuses.
300 600 Volt, 80 Amp. " "
200 600 Volt, 100 Amp. " "
400 600 Volt, 125 Amp. " "
Render monthly statement not later than the 5th of month following shipment of goods.
We reserve the right to cancel if not filled as specified.
No material in excess of specifications will be accepted.
Raise objections, if any, before proceeding to execute.
J. S. Wilson
ORDER
No 21155
BUICK MOTOR COMPANY
PURCHASE ORDER
FLINT, MICH. 3-22-16.
Economy Fuse Mfg. Co., Chicago, Ill.
SHIP TO Buick Motor Co., Factory # 16, North Flint, Michigan.
F. O. B. VIA REQ. NO. I 6797
QUANTITY
CONDITIONS AND INSTRUCTIONS
RENDER INVOICES IN TRIPLICATE on day of shipment accompanied by Bill of Lading, one copy to be priced and two copies not priced.
Defective goods will be promptly returned at your expense and credit taken on voucher. No goods returned as defective to be replaced without our formal purchase order.
No charges for packing or drayage will be allowed.
Payments made by voucher only.
No drafts will be honored.
50 600 Volt, 250 Amp. Economy Fuses.
10 600 Volt, 300 Amp. " "
50 600 Volt, 400 Amp. " "
10 600 Volt, 500 Amp. " "
10 600 Volt, 600 Amp. " "
Render monthly statement not later than the 5th of month following shipment of goods.
We reserve the right to cancel if not filled as specified.
No material in excess of specifications will be accepted.
Raise objections, if any, before proceeding to execute.
J. S. Wilson
ORDER
No 21146
BUICK MOTOR COMPANY
PURCHASE ORDER
FLINT, MICH. 3-22-16.
Economy Fuse Mfg. Co., Chicago, Ill.
SHIP TO Buick Motor Co., Factory # 16, North Flint, Michigan.
F. O. B. VIA REQ. NO. 16709
QUANTITY
CONDITIONS AND INSTRUCTIONS
RENDER INVOICES IN TRIPLICATE on day of shipment accompanied by Bill of Lading, one copy to be priced and two copies not priced.
Defective goods will be promptly returned at your expense and credit taken on voucher. No goods returned as defective to be replaced without our formal purchase order.
No charges for packing or drayage will be allowed.
Payments made by voucher only.
No drafts will be honored.
200 250 Volt, 35 Amp. Economy Fuses.
200 250 Volt, 45 Amp. " "
300 250 Volt, 60 Amp. " "
300 250 Volt, 75 Amp. " "
Render monthly statement not later than the 5th of month following shipment of goods.
We reserve the right to cancel if not filled as specified.
No material in excess of specifications will be accepted.
Raise objections, if any, before proceeding to execute.
J. S. Wilson

Repeat orders for Economy Fuses from particular buyers evidence the soundness of the Economy renewable principle and the high quality, safety, dependability and accuracy of the product. The capacities specified on the surrounding order forms, show that big users of energy protect all classes of power and lighting circuits with the fuses that cut protection cost 80 per cent a year.

Leading Jobbers

Since "Ye olde days of Ben Franklin's time"

when each man dipped his candles in his own house, there has been a steady evolution in the quality of light. The FRANKLIN MAZDA Lamp has marked the highest point in this perfection.

ye old time candle dip

But you buy more than quality of light when you buy the FRANKLIN MAZDA. You buy a rugged strength-for-service that insures a long and useful life to every lamp. You buy efficiency that saves you money on your cost-of-light. You buy full satisfaction with that lamp in a willing service that takes care of you.

buying ye modern lamp by the box

For the Central Station—the FRANKLIN MAZDA Lamp means freedom from complaints and saving on renewals.

For the Private Plant—the very high efficiency of the FRANKLIN MAZDA guarantees a minimum load; their ruggedness stands up under any factory vibration.

For the Contractor—it is the lamp that wins accounts. For FRANKLIN SERVICE suit your customer and FRANKLIN ADVERTISING loads your gun. The name of Franklin helps you sell.

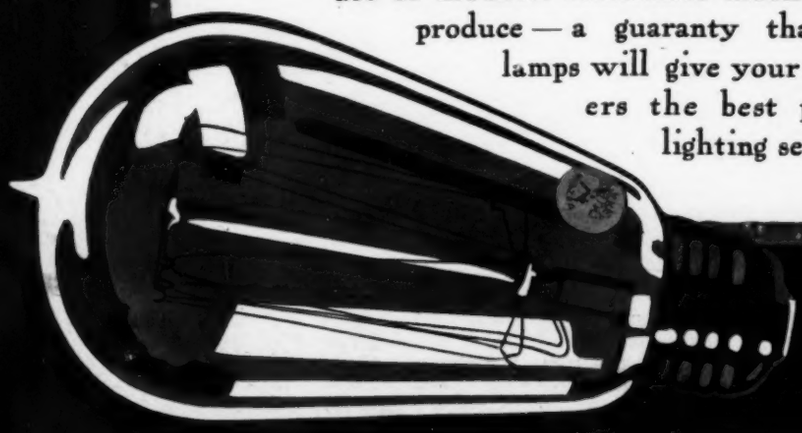
The Franklin Electric Mfg. Co.

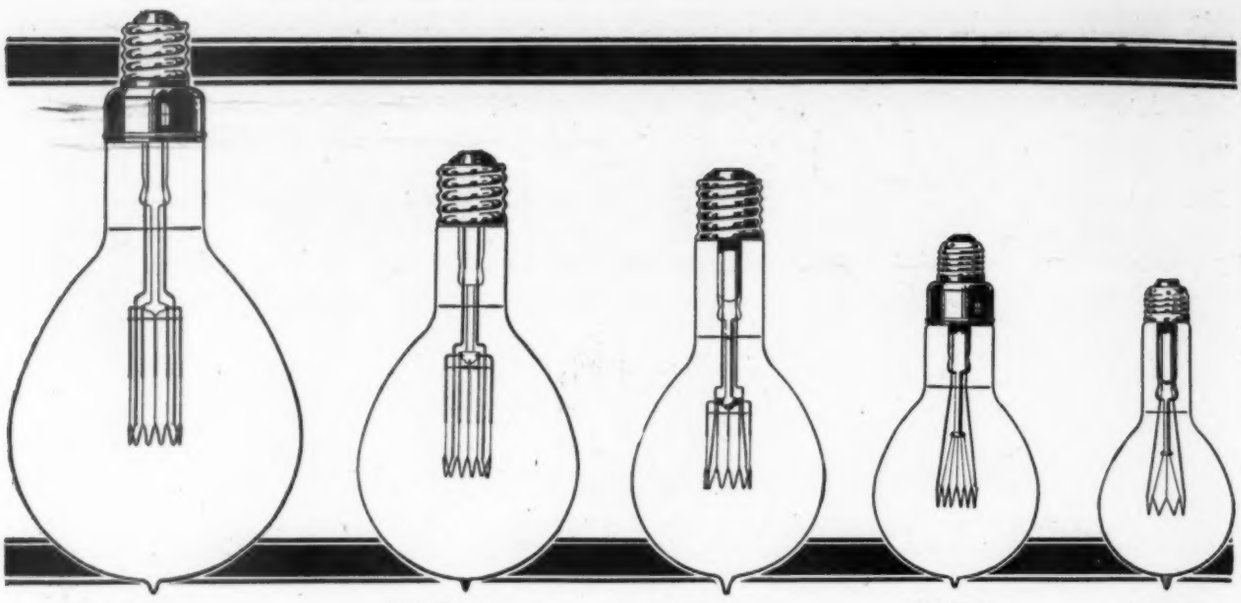
HARTFORD, CONN.

BUCKEYE MAZDA LAMPS

The Buckeye Electric Division
NATIONAL LAMP WORKS of GENERAL ELECTRIC Co
CHICAGO 54 W LAKE ST CLEVELAND O FULTON BLDG PITTSBURG
MEMBER SOCIETY FOR ELECTRICAL DEVELOPMENT
"DO IT ELECTRICALLY"

EVERY detail in the construction of Buckeye MAZDA Lamps is as nearly perfect as the use of modern scientific methods can produce — a guaranty that these lamps will give your customers the best possible lighting service.

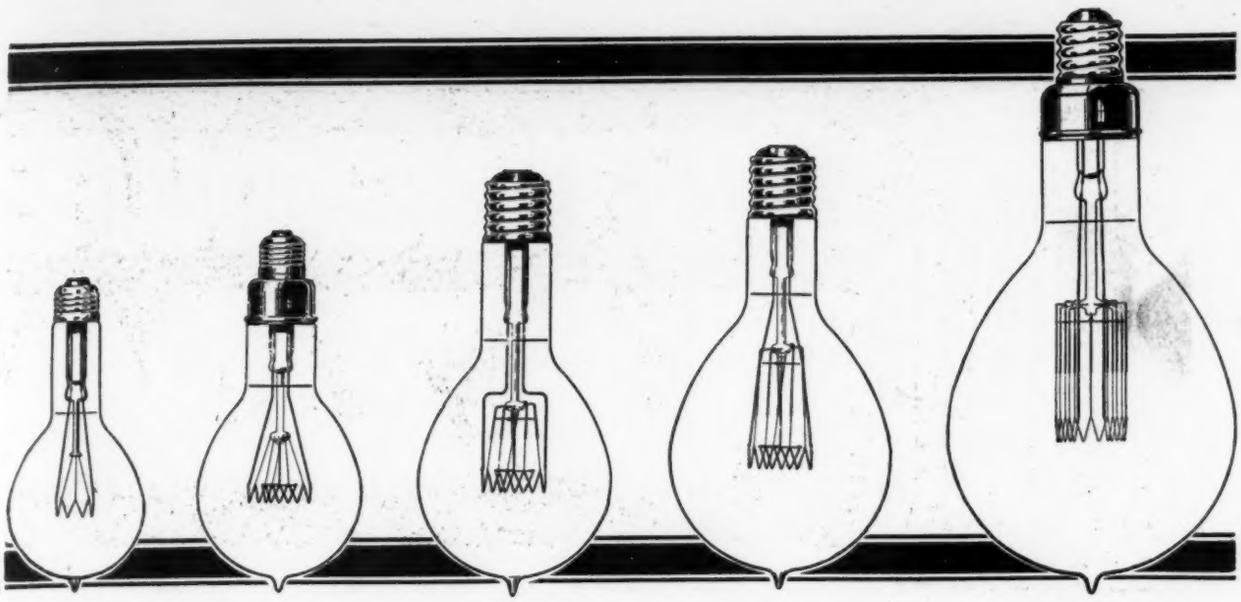




NATIONAL MA

NATIONAL MAZDA C lamps embodying the radically new departure in lamp manufacture—the gas-filled bulb—were announced little more than two years ago. Yet in the short period that has since elapsed this new line has grown till it now includes fourteen sizes for multiple operation and in addition MAZDA C lamps of seven candlepower ratings—from 60 to 1000—for series circuits. In National MAZDA C lamps, therefore, the electric light user has available a range of units adapted to a wide variety of illumination requirements. This is highly significant of National MAZDA progress.

NATIONAL LAMP WORKS
OF GENERAL ELECTRIC CO.
NELA PARK CLEVELAND, OHIO
Member Society for Electrical Development



75 WATTS 105-125 VOLTS | 200 WATTS 220-250 VOLTS | 300 WATTS 220-250 VOLTS | 400 AND 500 WATTS 220-250 VOLTS | 750 and 1000 WATTS 220-250 VOLTS

ZDA C LAMPS

THE number of National MAZDA C lamps now in use can be estimated in the millions. In two years they have put the standard of commercial lighting on a much higher plane. They have introduced effective illumination into factories, mills and shops everywhere. The lower wattage sizes, and especially the new 75-watt unit, promise to become an important feature in home lighting.

From the Central Station Manager's viewpoint, National MAZDA C lamps have opened up greater possibilities for service, and at the same time have been the means of noticeably increasing kilowatt output.

NATIONAL LAMP WORKS
OF GENERAL ELECTRIC CO.

NELA PARK CLEVELAND, OHIO

"DO IT ELECTRICALLY"

WESTINGHOUSE MAZDA

BACK OF THIS LAMP

there is

the name Westinghouse, which stands foremost in the ranks of names representing the highest type of American business.

—a selling organization composed of men who know the electrical business and who are qualified to offer sound advice on selling problems.

—a manufacturing organization whose watchword is superior quality—whose aim is perfection in quality and service.

These are the reasons why those who sell Westinghouse Mazda Lamps are successful and those who use them are satisfied.

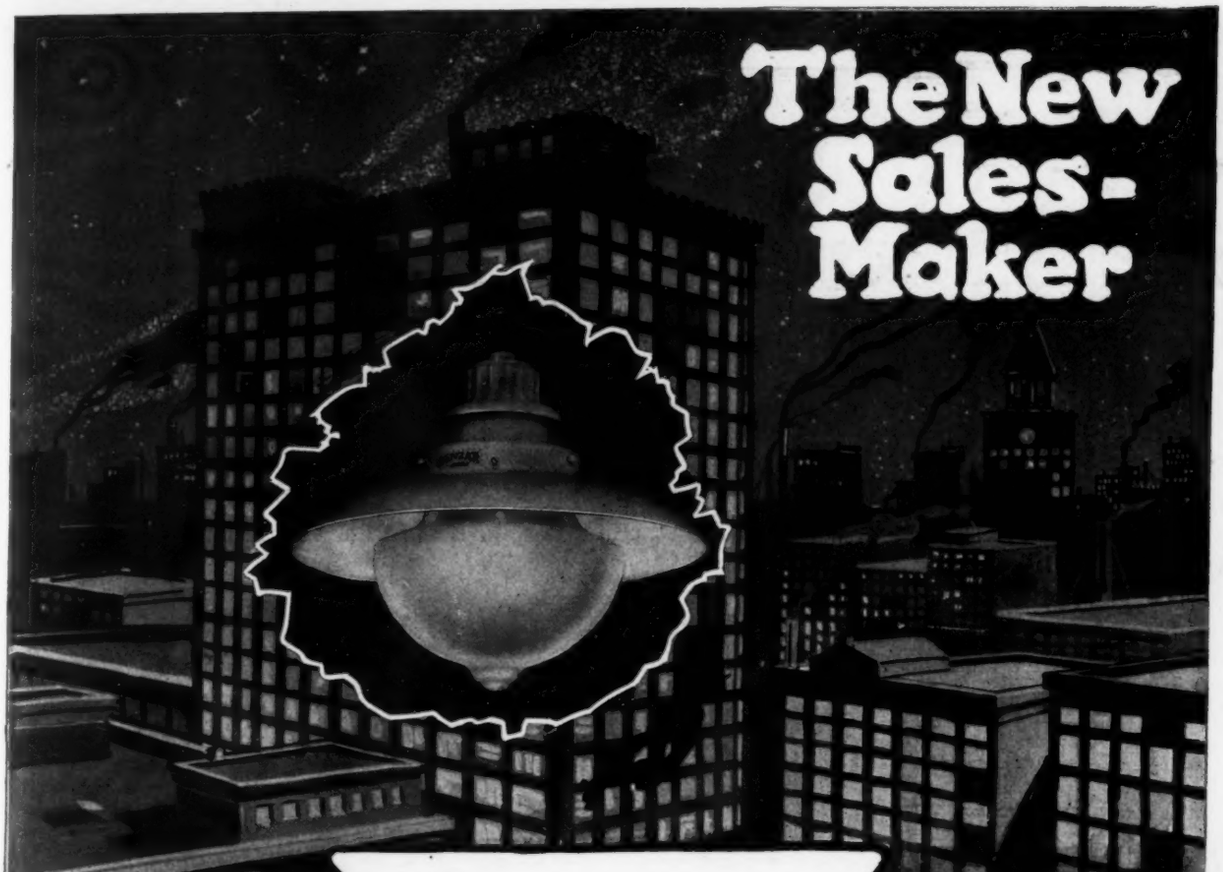
Westinghouse Lamp Company

Atlanta	Cincinnati	Kansas City	Pittsburgh
Baltimore	Cleveland	Los Angeles	Portland
Boston	Columbus	Milwaukee	St. Louis
Buffalo	*Dallas	New Orleans	Salt Lake City
Butte	Denver	New York	San Francisco
Chicago	Detroit	Philadelphia	Seattle
			Syracuse

*Westinghouse Lamp Corporation.

Export Sales Dept.—165 Broadway, N. Y. C.
For Canada—Canadian Westinghouse Co., Limited, Hamilton, Ont.
Member Society for Electrical Development—Do It Electrically.

"Guaranteed by the Name"



DENZARS appeal to your trade because they save work and money. They ought to interest you because of the profit they will make and the sales-work they'll save.

DENZARS

open a new and profitable market for the progressive merchant. They are entirely different than any other unit on the market. It isn't necessary to talk "hot air" in selling them. Their superior features are so apparent that every one sees them at a glance.

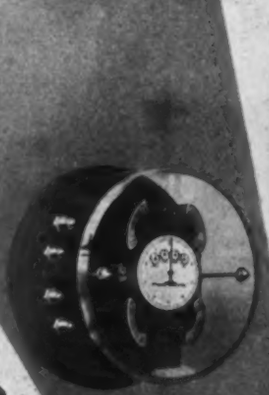
You'll want the special folder that tells why

Beardslee Chandelier Mfg. Co.

220 South Jefferson Street

CHICAGO

METER SUPREMACY



Sangamo Polyphase Switchboard Type Watthour Meter
Also made singlephase

Sangamo Type H Watthour Meter
with metal cover
Is also made with glass cover

Sangamo Switchboard Type Amperehour Meter
Also made in service types

Sangamo Type MS Amperehour Meter
For use with the batteries of isolated plants, electric vehicles, automobiles, wireless work, etc.

Sangamo Economy Electric Railway Watthour Meter

Also graphic or curve-drawing Wattmeters, Ammeters and Voltmeters. Circuit Breakers, Shunts

FOR EVERY PURPOSE

ASK FOR BULLETINS AND FULL DETAILS

SANGAMO

BUILT LIKE A WATCH

Sangamo Electric Company
Springfield, Illinois

DEUTH & CO., INC.

Executive Offices, Equitable Building
NEW YORK CITY

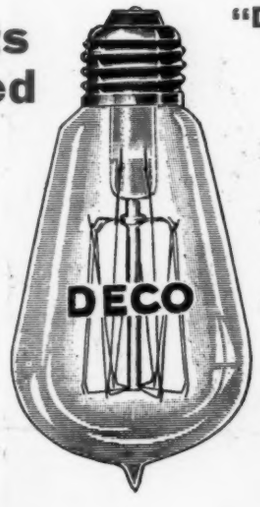
"DECO" LAMPS

Nitrogen Tungsten Carbon

Some Users of "DECO" Lamps

Equitable Building
Adams Express Building
The Vincent Astor Estates
Hamburg-American Building
McAlpin Hotel
Hotel Astor
Delmonico's
Lord & Taylor Dept. Store
Gimbel Bros. Dept. Store
Abraham & Strauss Dept. Store
A. I. Namm & Sons Dept. Store
Oppenheim Collins & Co., Dept. Store

Agents Wanted



Some Users of "DECO" Lamps

New York Public Library
Department of Education, City of New York
Department of Docks and Ferries, City of New York
Thompson Starrett Co.
Hercules Powder Co.
American Car & Foundry Co.
Atlantic City Steel Pier Co.
Central Coal & Iron Co.
Young Men's Christian Assn., New York City

Owing to the enormous increase of our business we will move our offices from the Fifth National Bank Building to the Equitable Building, 120 Broadway, New York City, on June 1st, where we will be in the center of the financial and business district of the country.

DEUTH & CO., INC., New York-Rotterdam-Vienna

Chicago Agent—Peerless Light Co., 174 W. Randolph St.

OUR LATEST CREATION

N. E. L. A.

Delegates and Visitors to the 1916 Convention City will find many of Chicago's principal streets and boulevards decoratively lighted with

King-Standards

Note their beauty by day---their efficiency by night.

King Ornamental Posts and Standards are made in a wide variety of designs to meet every street, parkway, boulevard, institution and private estate lighting requirements.

Write us for full descriptive data and prices. Our engineering service is at your disposal.

King Foundry Co.

St. Joseph, Mo.

Chicago Office, 927 Monadnock Block

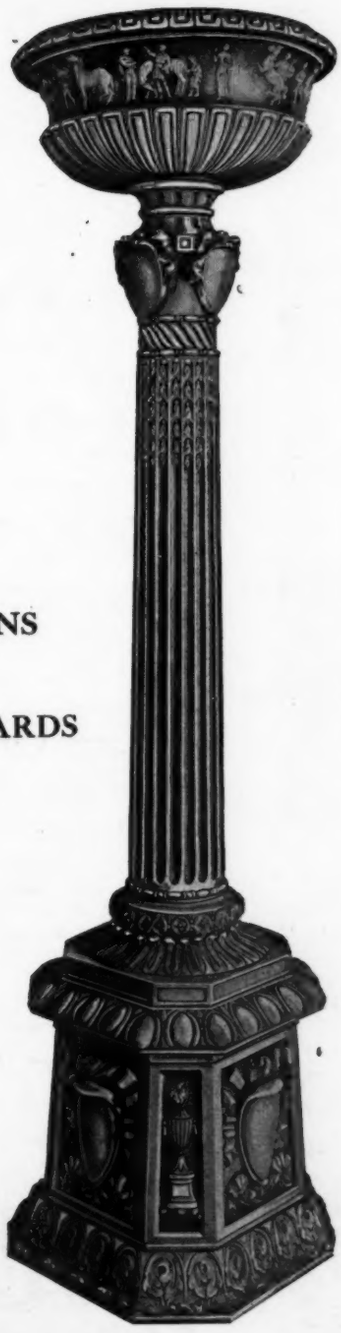
Specialists in Ornamental Lighting

TRADE MARK

MOHRLITE

REGISTERED

BIVOUAC STANDARD



SPECIAL DESIGNS
FOR
INTERIOR
LIGHTING STANDARDS

GOLD MEDAL
AWARD
SAN FRANCISCO
1915

THE
MOHRLITE
COMPANY

FACTORY AND
GENERAL SALES OFFICE
URBANA,
OHIO

A complete set of

LUX NITROS

40 Watt
$ .60

60 Watt
$ .60

75 Watt
$ .65

100 Watt
$1.00

150 Watt
$1.50

200 Watt
$2.00

250 Watt
$2.50

300 Watt
$3.00

350 Watt
$3.50
and upward

Lux Specialties

LUX MFG. CO.

Factory and General Offices: Hoboken, N. J.

New York Office: 1328 Broadway
Cleveland Office: J. Phillips Co., 2114 E. 2nd St.
Chicago Office: 1432 So. Michigan Ave.
Philadelphia Office: 47 N. 13th Street

Western Coast Agents:
ASSOCIATED MFRS. LAMP CO.
883 Market St., San Francisco, Cal.

PHENIXLITE

PATENTED

The most efficient semi-indirect unit made. It produces a great volume of perfectly mild light which diffuses all around as ideal illumination should. They want Phenixlite. Give it to 'em.

ASK US ABOUT IT.

THE PHOENIX GLASS CO.
New York Chicago Pittsburgh Boston

QUALITY RENEWED TUNGSTEN LAMPS

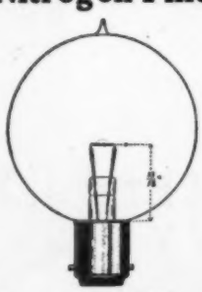
We manufacture high grade renewed Tungsten Lamps and pay cash for burned outs.

Anchor Electric Company
559 West Jackson Blvd. Chicago, Ill.
Tungsten, Nitrogen and Carbon Lamps
Also manufacturers of high frequency Electrodes and all kinds of glass work.

Best Grade Renewed Lamps

Both Carbon and Tungsten Types
We guarantee you most for the money
BOSTON-ECONOMY LAMP DIVISION
National Lamp Works of General Electric Co.
128 MAPLE STREET DANVERS, MASS.

Nitrogen Filled Automobile Lamp



A Sensation

Drawn tungsten wire, helically wound, and the bulb filled with an inert gas! The most efficient miniature lamp made. Leading auto mfrs. use it on best cars. Largest dealers handle it. Biggest discounts—strong guarantee. We stand behind every lamp we make. Write for prices and discounts.

The A. C. Mannweiler Co. Fort Wayne Indiana

"I'm Yours for Double Duty"

"I'm the Chap

who does the work of two sockets where only one did duty before."

Increase and multiply is my motto, and for that reason my central station friends love me.

I furnish the needed extra socket for the fan—and because of me, more fans are whirring their messages of coolness.

I help the housewife. Flat-iron, toaster, percolator, vacuum cleaner, heater, portable lamp, chafing dish, hot plate,—oh, there are many electrically heated household devices that would not be in use but for me.

All the Dealer Helps are FREE. Don't miss the sales value of a Benjamin 92 window. Write for the Free Helps.

I'm found in the office as well as the home. Garages use me. Where things are made in factories it is cheaper and more convenient to call on me than to install an extra socket.

My service is without limit, yet I am your servant without cost. For though I increase your profits, I am bought and paid for by those who think a dollar a trifling sum to pay for what I give.

"I'm Benjamin 92"

BENJAMIN ELECTRIC MFG. COMPANY

120-128 S. Sangamon St.

NEW YORK 114 Liberty St. | CHICAGO | SAN FRANCISCO 590 Howard St.

TORONTO | LONDON, ENG.

"Junior Imp" Instruments

For battery charging equipments, small panels, and similar applications.

"Torsion" Type Wattmeters

For laboratory work and precision testing in general.

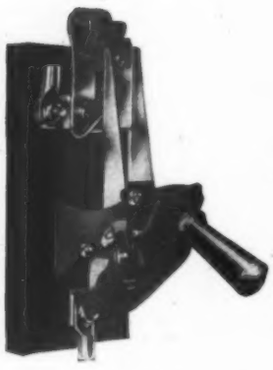
From one extreme to the other

There is a

ROLLER SMITH

Instrument, Circuit Breaker or Meter for every need.

Descriptive matter covering all these lines is yours for the asking.



"Industrial" Type Circuit Breakers

For small motors, feeder circuits and industrial work in general.

"Standard" Type Circuit Breakers

For switchboard work and installations where Circuit Breakers of the highest quality are desired.

Type "D" Watt-Hour Meters

For house service, metering circuits in industrial plants and the like.

Type "S. A." Watt-Hour Meters

For switchboards of all kinds up to the largest ones in modern power plants.

Roller-Smith Company

233 Broadway, New York

Factory
BETHLEHEM, PA.

CHICAGO
Monadnock Block

CLEVELAND
Williamson Building

WIRT DIMMING SOCKETS

No. 31. 2¼ Shade Holder

TURN DOWN ELECTRIC LIGHT

FIVE DEGREES OF LIGHT
FULL
HALF
DIM
NITELITE
OUT

SAVE CURRENT
30% to 80%

No. 32. No Shade Holder

The tremendous and continued demand for No. 23 Dim-a-Lite attachment proves conclusively that the electrical public want Sockets that turn electric light "up and down" and save current.

The economy and many great comforts and conveniences effected by the installation of these Sockets increases daily the thousands of enthusiastic users.

Install them on fixtures in the Hall, Living Room, Bedroom, Nursery, Sickroom, and on the porch for a low summer light.

Contractors—Your men are working in homes every day. Show these new Sockets; it means new business.

Fixture Dealers—Explain these Sockets to purchasers of new fixtures. Give your customers the advantage of the latest and greatest development in electric lighting.

Order From Your Jobber. ***Write for Bulletin 102***

WIRT COMPANY

Philadelphia, Pennsylvania

FIRE ALARM SYSTEMS

FOR USE ON

Alternating Current

The Palmer Electric & Mfg. Co., Boston, Mass.

Trade Mark Reg. U. S. Pat. Off.
SAMSON SPOT WATERPROOFED CORD FOR TROLLEYS AND ARC LAMPS
Send for Samples SAMSON CORDAGE WORKS, Boston, Mass.

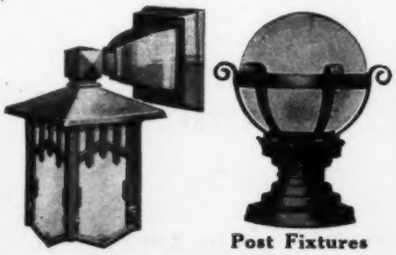
Service That Pays Its Own Way

Loxon Lamp Guards give service of this kind because they prevent lamp breakage and the unauthorized removal of Lamps.

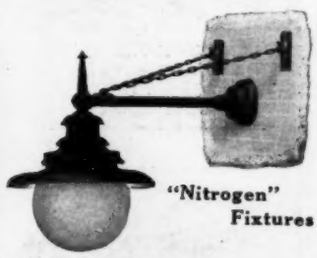
Loxon Lamp Guards are sold by the leading Electrical Dealers.

McGILL MFG. CO.

26 Oak Street Valparaiso, Ind.



Post Fixtures

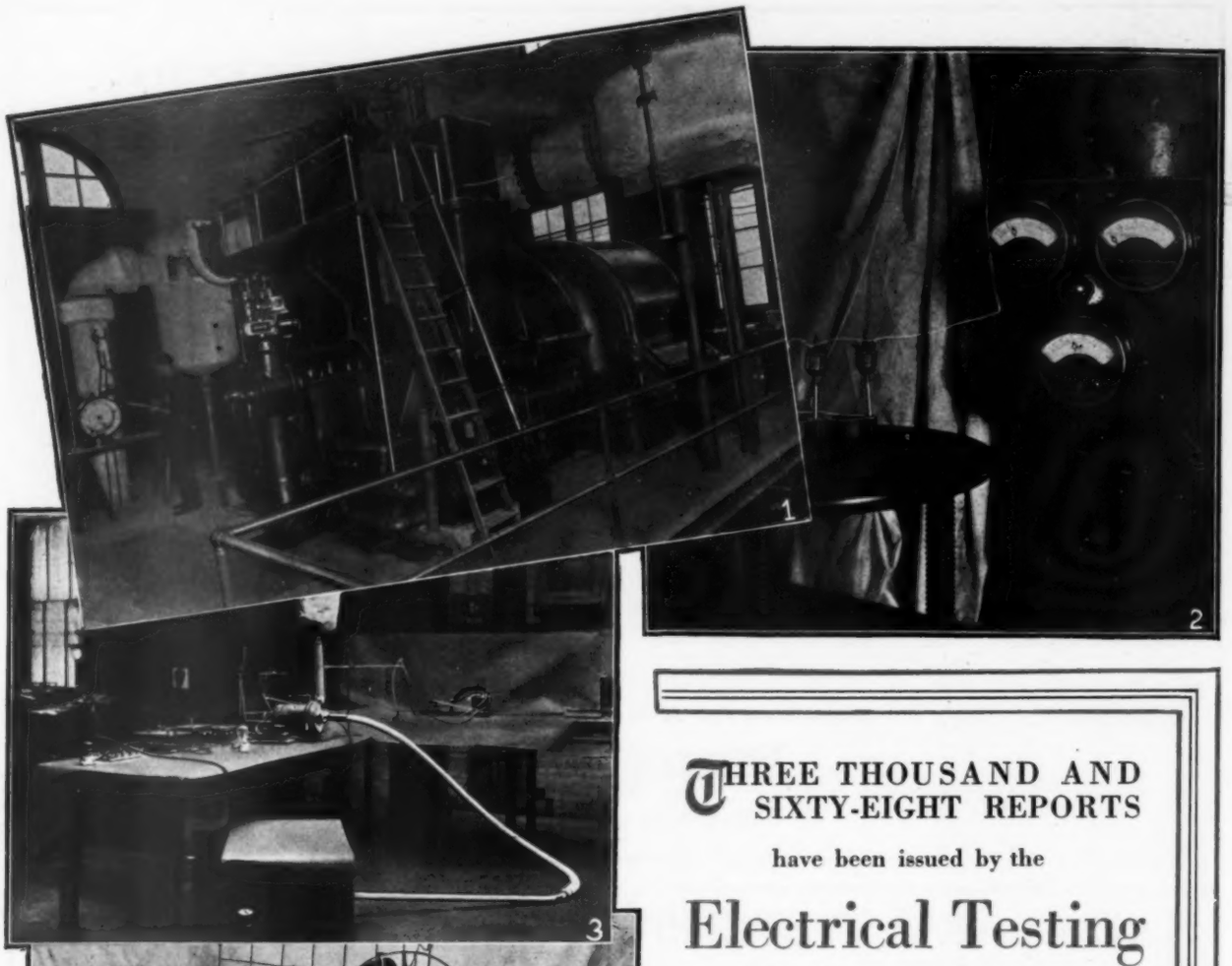


"Nitrogen" Fixtures

Herwig Cast Metal Out-door Lighting Fixtures of Every Description

Brackets, Pocket Lanterns, Ceiling Lights, Standards, Etc. **Write for Catalog**

Herwig Art Shade & Lamp Co., 2140 N. Halsted St., Chicago, Ill.



1—Test of 7,500 K.V.A. Turbo-Generator after Installation.
2—High Voltage Test on Small Armatures.
3—Vacuum Cleaner Test. Test for Displacement of Air and Vacuum.
4—Test of Distribution of Air and Efficiency of Electric Fans.

THREE THOUSAND AND SIXTY-EIGHT REPORTS

have been issued by the

Electrical Testing Laboratories

since the 1915 N. E. L. A. Convention. These represent tests for:

(1) CENTRAL STATIONS — Representing practically all materials and apparatus from coal to lamps or motors, and many applications of power and light.

(2) MANUFACTURERS—Tests of their product and purchases from the raw material through successive steps of manufacture to the finished product. Industrial research.

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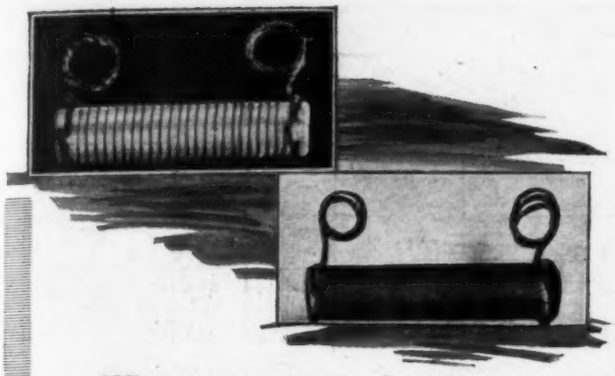
Such tests have been of value to them.

The facilities of the Electrical Testing Laboratories offer to the smallest manufacturer and central station the same advantages of laboratory and technical staff as are enjoyed by the largest concerns in the industry. We should be glad to correspond with you about your problems.

The fees are low, with due regard for accurate, thorough work.
Write for Bulletin and Schedule of Prices.

Electrical Testing Laboratories

Eightieth Street and East End Avenue **NEW YORK**



Why twenty years of service could not affect

Ward Leonard
Enameled Resistance Units

The vitreous enamel hermetically seals and absolutely protects the resistance wire against chemical, electrical and mechanical depreciation. The cut shows a resistance unit before and after the enamel is applied.

Ward Leonard Electric Co.
Mount Vernon, N. Y.
Badt-Westburg Electric Co., Chicago, Ill.
John B. Sebring, Pittsburgh, Pa.

A "Labor-hour"

Sent on approval for one week

is made up of both productive and non-productive effort.

As you eliminate the latter your profits increase—lifting out the non-productive effort is a study of minutes,—hundredths of a minute.

And because the non-productive intervals are scattered throughout the minute or hour, this is only possible with an instrument which will measure the work as it is "worked" and "loaf" during the waste effort.

The "Decimal" time and motion study watch automatically measures either *work* or *rest;* it separates one from the other; shows at a single reading the net output or production per hour.

It is the one "stop-watch" by which these calculations may be made without additional computation.

A superintendent using the "Decimal" time and motion study watch is able to eliminate the greater part of productive effort from the total "labor-hours."

Therefore there can be no surer way to increased efficiency and added profits than by the regulation of labor-hours through the use of the "Decimal" watch.

That you may prove for yourself its value as an aid to increased production and greater profits,

We will ship the "Decimal" watch on approval for one week to any official or department head who will send us his name.

MORTIMER J. SILBERBERG
122 So. Michigan Ave. *Engineer* **CHICAGO, ILL.**

A SLEEPLESS SENTINEL

is the best description for a Hartford Time Switch. For all light and power circuits where it is desired to control current for intervals of predetermined length.

Used for show window lights, electric signs, street lights, apartment house halls, charging storage batteries and similar other work.

Mounted in weatherproof iron case, tested and guaranteed perfect.

75 to 200 amp.
250 V.

Approved by underwriters laboratories—large stock—immediate shipment.

Just wind it once a week, that's all!

Hartford Time Switch Co.
A. HALL BERRY
GENERAL SALES AGENT
97 WARREN STREET
NEW YORK

Northern Electric Company
LIMITED
CANADIAN REPRESENTATIVE

Renewed Tungsten Lamps

Our Renewed Tungsten Lamps
have long life, give brilliancy of new lamps and at considerable less cost

WE PAY CASH FOR BURNED-OUT LAMPS

Manufacturers and Jobbers of

TUNGSTEN, NITROGEN AND CARBON LAMPS

Also Manufacturers of High Frequency Electrodes and All Kinds of Glass Work

Anchor Electric Co.

559-561 W. Jackson Blvd., Chicago

It is the Insulating Quality That Counts

Heavily Coated With a Composition of Especially High Insulation Resistance

Its Adhesiveness is Long Lasting and Therefore The Finished Job is Well Insured

Another Member of Our Dependable Brand Family

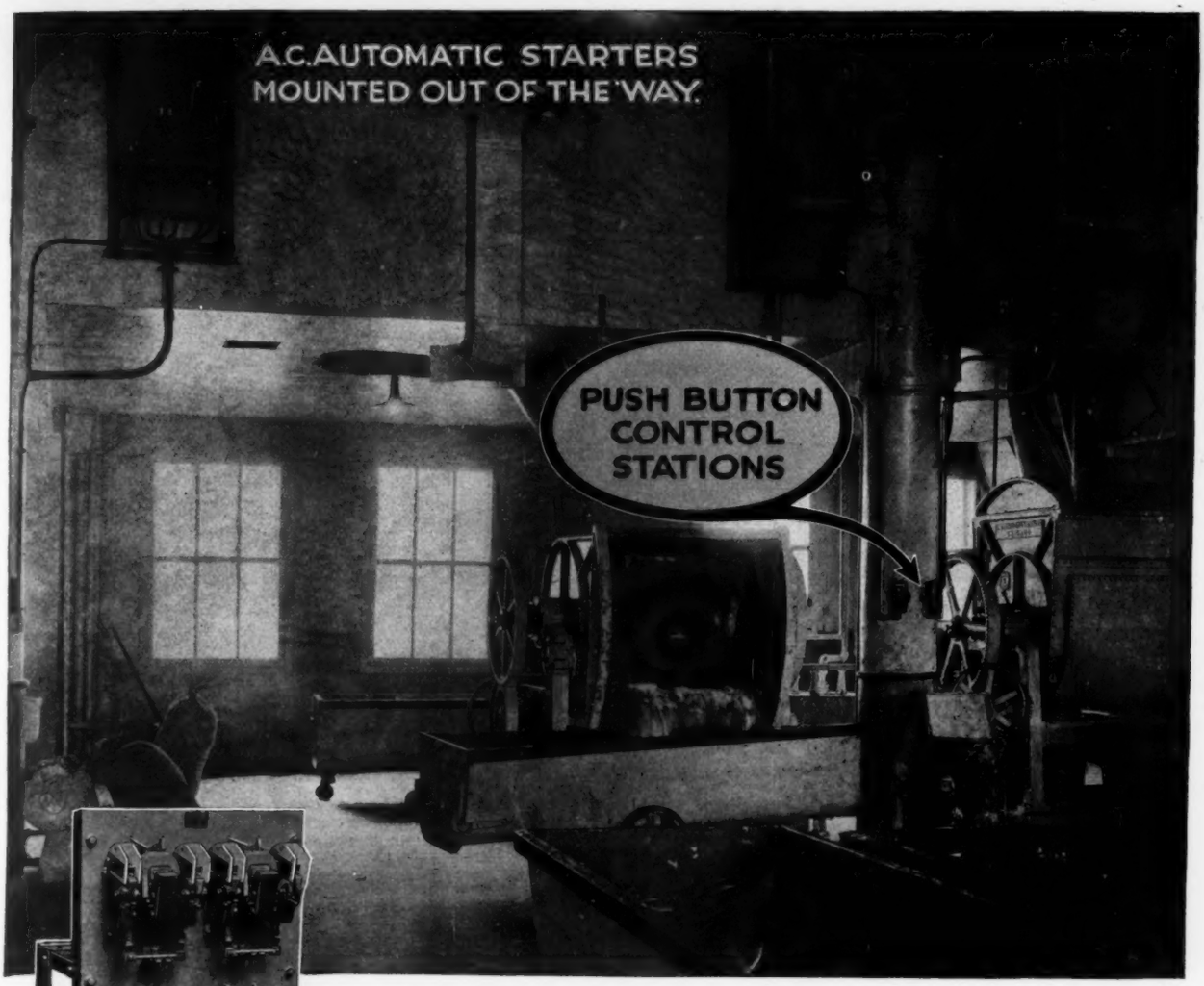
Buckeye Splicing Tape

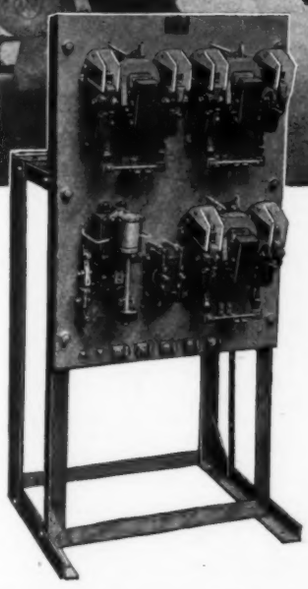
Represents Extra Factors of Strength, Encasing the Splice in a Puncture-Proof Envelope

Make the Splice—Then Forget It—Buckeye Becomes Part of the Insulation

The Mechanical Rubber Co.

Cleveland





Type of C-H Automatic Controller Panel Shown Above

Central Station Service and C-H Push Button Control in Schulze Bakery, Chicago

A. C. Central Station service is used in the well-known Schulze Bakery, of Chicago.

The six squirrel cage motors driving the dough mixers are started and stopped from push button stations. The Cutler-Hammer A. C. Automatic starters are mounted above and out of the way. Throughout the plant other C-H controllers are used in connection with motors driving pumps, conveyors, compressors, etc.

When installing motor-driven equipment insure success by providing Cutler-Hammer Control Apparatus. Our nearest office will be pleased to give you any information required.

THE CUTLER-HAMMER MFG. CO. MILWAUKEE

NEW YORK: Hudson Terminal, 50 Church St. CHICAGO: Peoples Gas Bldg. PITTSBURGH: Farmers Bank Bldg
BOSTON: Columbian Life Bldg. PHILADELPHIA: Commonwealth Bldg. CLEVELAND: Schofield Bldg.
CINCINNATI: Gwynne Building
PACIFIC COAST AGENT: H. B. Squires Co., 579 Howard St., SAN FRANCISCO, San Fernando Bldg., LOS ANGELES. and Morgan Building, PORTLAND, ORE.

An Unsolicited Opinion from a Prominent Electric Vehicle Dealer on the Reliability of

The 4 "Exide" Batteries

"Exide", "Hycap-Exide", "Thin-Exide", "Ironclad-Exide"

For Electric Pleasure and Commercial Vehicles

"We sometimes feel that in the Automobile business, the only evidence we have that our goods and service are satisfactory to our customers, is a lack of kicks and complaints.

"We know from experience that it is pleasant to sometimes hear of such satisfaction in a more direct manner, and we feel it is only fair to you, as it is a pleasure to us, to express frankly, the satisfaction which we and our customers experience in the use of "Exide" goods.

"We have sold your batteries in _____ Electric cars for the past eight years, and our records show that during that whole period "Exide" goods and service have been very satisfactory and pleasing. Many of those cars, some equipped with "Exide", some with "Ironclad-Exide" batteries, have to their credit, mileage records that are remarkable.

"It is almost an unknown experience to find an "Exide" battery that does not give a much greater mileage than we guarantee or claim, and this, considering the fact that these cars are charged and cared for under all kinds of conditions, in many cases subject to all kinds of abuse, speaks volumes for the rugged reliability that is built into your plate.

"We congratulate you and wish you a continuation of the success which you have achieved and which you are entitled to."

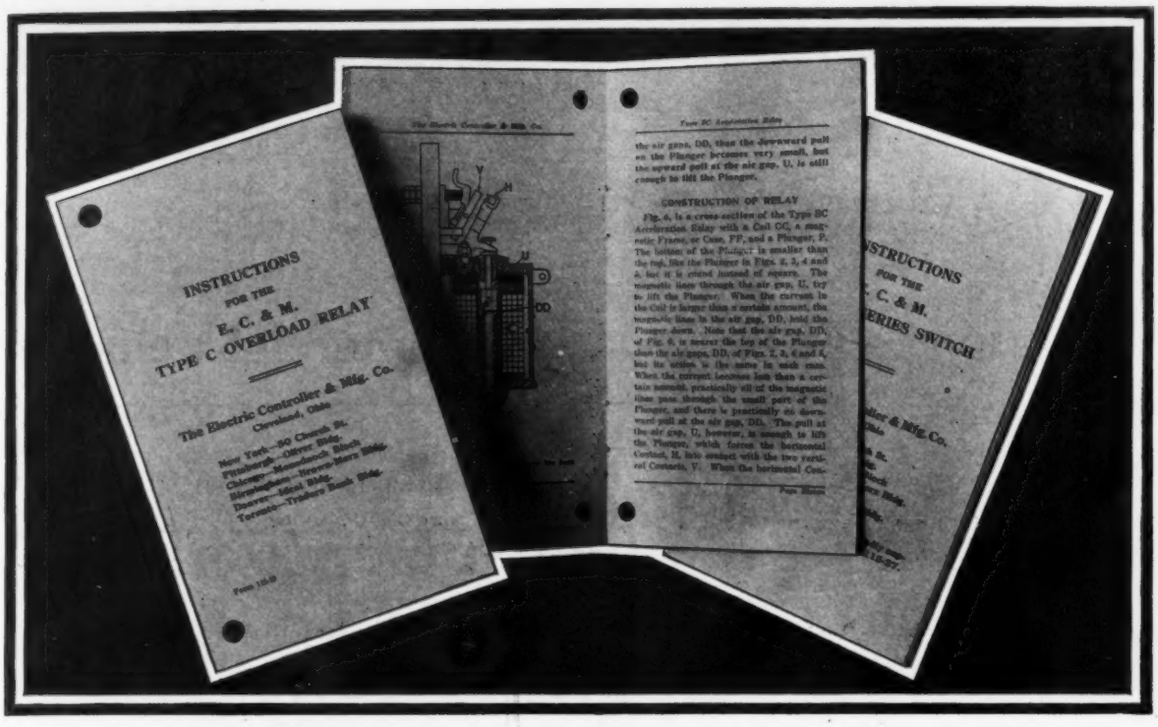
THE ELECTRIC STORAGE BATTERY CO.

Manufacturer of

The "Chloride Accumulator", The "Tudor Accumulator"

The "Exide", "Hycap-Exide", "Thin-Exide" and "Ironclad-Exide" Batteries

New York Cleveland Boston Atlanta Chicago Pittsburgh PHILADELPHIA, PA. 1888-1916 Denver Rochester Detroit San Francisco Washington St. Louis Toronto



The E. C. & M. Co. has prepared Instruction Books for its products.

They explain the theory of operation, the best ways of taking care of equipment, how to replace wearing parts, and many other practical points found out only by use.

The Instruction Books are part of the service which the E. C. & M. Co. gives, in additon to the machines which it sells.

We are very much pleased when people ask for Instruction Books.

THE ELECTRIC CONTROLLER & MFG. CO.
CLEVELAND, OHIO.
NEW YORK-50 CHURCH ST.
PITTSBURG-OLIVER BLDG.
BIRMINGHAM-BROWN-MARX BLDG.
CHICAGO-MONADNOCK BLK
DENVER-IDEAL BUILDING
TORONTO-TRADERS BANK BLDG.

Going To The Convention?

WE cordially invite you to visit our booth at the National Electric Light Convention, which is to be held in the Auditorium Theatre, Chicago, May 22d to 26th. We will occupy spaces Nos. 17-19-21.

At our booth you will find plenty of comfortable chairs, a real atmosphere of welcome and a willingness to discuss any and all problems.

SAVE TIME AND FREIGHT
DYNAMOS-MOTORS
WESTERN ELECTRIC COMPANY
TELEPHONES-SUPPLIES
Western Electric Company
INCORPORATED
New York Atlanta Chicago Kansas City San Francisco
Buffalo Richmond Milwaukee St. Louis Oakland
Newark Savannah Indianapolis Dallas Los Angeles
Philadelphia New Orleans Detroit Houston Seattle
Boston Birmingham Cleveland Oklahoma City Portland
Pittsburgh Cincinnati Minneapolis St. Paul Omaha Denver Salt Lake City
EQUIPMENT FOR EVERY ELECTRICAL NEED
MEMBER OF
SERVICE
SOCIETY FOR ELECTRICAL DEVELOPMENT
SAFETY

This Trade Mark The Guarantee of Excellence on Goods Electrical.

The Guarantee of Excellence on Goods Electrical

With few exceptions the products of the General Electric Company comprise every kind of apparatus and machinery used in the generation, transmission, distribution and use of electrical energy. Its thousands of products, in use in all parts of the world, have established the G-E Trade-Mark as the Guarantee of Excellence on Goods Electrical. As in the past the General Electric Company will continue to be foremost in all developments and improvements tending toward the perfecting of present electrical service and its extension into new fields of usefulness.

The products described on the following pages are representative of real progress in what may be termed load-building or current-consuming appliances. The information given is timely and worth while to those interested in the commercial distribution of electrical energy.

General Electric Company

General Office: Schenectady, N. Y.

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Seattle, Wash.
Spokane, Wash.
Springfield, Mass.
Syracuse, N. Y.
Toledo, Ohio
Washington, D. C.
Youngstown, Ohio

For Michigan Business refer to General Electric Company of Michigan, Detroit.

For Texas, Oklahoma and Arizona business refer to Southwest General Electric Company (formerly Hobson Electric Co.), Dallas, El Paso, Houston and Oklahoma City. For Canadian business refer to Canadian General Electric Company, Ltd., Toronto, Ont.

6234

This Trade Mark The Guarantee of Excellence on Goods Electrical.

Three Types of G-E Ranges

The Type S
Electric Range

The Type R
Electric Range

The Type K
Electric Range

The Type S electric range, one of the three styles of which is shown above, is a very high grade range selling at prices from $70 to $110. It is furnished with low or elevated oven and in the cabinet style as shown above.

Type S Ranges are furnished in plain or nickel finish. They are equipped, as are all G-E Ranges, with the famous G-E sheathed wire heating units, which are easily removable for cleaning.

The Type S Range has been adopted as standard in large districts where electric cooking has become standard.

Type R electric ranges are constructed with a special form of heat insulation resulting in maximum economy of operation.

The exterior surfaces of Type R Ranges are paneled wherever possible and have an extra fine finish. The hot plates and cookers are inserted in the flat cooking top which is smooth and free from crevices to collect dirt and particles of food. The inside of all ovens are nickel plated and have welded steam-proof seams.

Type R Ranges are furnished in four styles having, respectively, low and elevated ovens and in the popular cabinet type with or without back.

The prices of Type R Ranges vary from $125 to $225, depending on style.

The new Type K electric ranges are manufactured to sell at a price slightly higher than the Type S. They are made in several styles similar in appearance to the Type S line, but having a larger oven and an outlet for socket appliances.

Nickel trim and white enameled splashers and door panels are used and, in one of the styles, a separate broiling compartment in addition to baking and warming ovens is provided.

All Type K Ranges have a thermometer on the oven door and are equipped with the positive oven latch.

Prices vary from $50 on the 2-"hole" cooker to $185 on the 6-"hole" cabinet style.

General Electric Company

General Office: **Schenectady, N. Y.**

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6235

This Trade Mark The Guarantee of Excellence on Goods Electrical.

This Trade Mark The Guarantee of Excellence on Goods Electrical.

Proof that Quality Counts

Form 9

Form 4

Form 8

Although comparatively recent on the market, the following cities have already or are about to install Novalux Ornamental Units:

Havana	Cuba
Pasadena	California
Los Angeles	California
Canada	
Miami	Florida
Adebolt	Iowa
Nashua	Iowa
Grundy Center	Iowa
Cascade	Iowa
Streator	Illinois
Naperville	Illinois
Marseilles	Illinois
Danville	Illinois
Monticello	Illinois
Marengo	Illinois
Willmette	Illinois
Chicago	Illinois
Indiana Harbor	Indiana
Hammond	Indiana
Whiting	Indiana
Evansville	Indiana
Richmond	Indiana
Boston	Massachusetts
Cambridge	Massachusetts
Lynn	Massachusetts
Sault Ste. Marie	Michigan
Grand Rapids	Michigan
Detroit	Michigan
Muskegon	Michigan
Sturgis	Michigan

"G-E Light Your Streets"

Pontiac	Michigan
Saginaw	Michigan
Jackson	Michigan
Charlotte	Michigan
Ludington	Michigan
Bar Harbor	Maine
Waseca	Minnesota
Northfield	Minnesota
Fairmont	Minnesota
Hallock	Minnesota
Mankato	Minnesota
Shelby	North Carolina
Gastonia	North Carolina
Greenville	North Carolina
Mooresville	North Carolina
Williston	North Dakota
Newark	New Jersey
Trenton	New Jersey
Tonawanda	New York
Beacon	New York
Patchogue	New York
Ithaca	New York
Port Jervis	New York
Rochester	New York
Cohoes	New York
Reno	Nevada
Greenfield	Ohio
Coshocton	Ohio
Philadelphia	Pennsylvania
Bellefonte	Pennsylvania
Madison	South Dakota
Chattanooga	Tennessee
Plainview	Texas
Winchester	Virginia
Kenosha	Wisconsin
Viroqua	Wisconsin
Madison	Wisconsin
Waunekee	Wisconsin

General Electric Company

General Office: **Schenectady, N. Y.**

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6236

This Trade Mark The Guarantee of Excellence on Goods Electrical.

This Trade Mark The Guarantee of Excellence on Goods Electrical.

Battery Charging

Three Unit Battery Charging Motor Generator Set

The above illustration shows an induction motor in center driving 10 Kw. 55 Volt Generator at each end. Generators used separately for charging 20-cell batteries, or in series for charging 40-cell batteries.

These outfits are supplied in any kw. capacity required. The panels are built to give the particular control of the charging circuits desired by the customer.

Write for booklets 5030 and 4529, describing small individual sets for home charging.

Runabout Type Mercury Arc Rectifier

A simple, economical device for charging batteries in electric vehicles. This rectifier is adaptable to either rapid or slow charging. It is the ideal outfit for the private garage. It is easily operated, requires no oil or grease and occupies very little floor space. It can be used for pleasure runabouts or for light delivery cars.

To the central station the G-E Mercury Arc Rectifier is always a good proposition for increasing the night load. Send for booklets B-3347 and B-3075.

Portable Rectifier for Ignition Battery Charging

An inexpensive type of Mercury Arc Rectifier for charging small storage batteries, used for starting, lighting and ignition on gasoline cars, motor boats, etc. There are many other uses for the Form K Rectifier where not over 5 amp. 15 volts d.c. are required and only a.c. is available.

This Rectifier will charge one three-cell, one six-cell, or two three-cell batteries, as required. Because of its portability, it can be plugged into the most convenient lamp socket and left till charging is complete.

Send for Booklet 3374 describing in more detail this popular Rectifier.

General Electric Company

General Office: Schenectady, N. Y.

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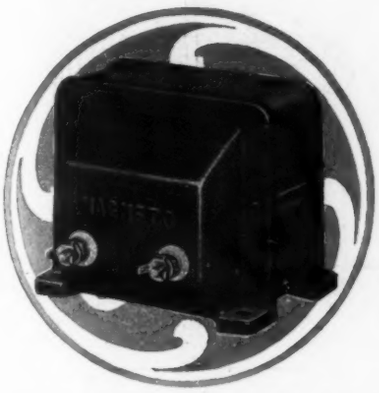
6237

This Trade Mark The Guarantee of Excellence on Goods Electrical.

This Trade Mark The Guarantee of Excellence on Goods Electrical.

Transformer Specialties



Waynelite Transformer for Ford Cars

This transformer has been developed for steadying the headlights on Ford Cars. At low speeds without the transformer the lamps connected in series and operating from the magneto are considerably dimmed and the amount of light obtained is practically useless. At high speeds the rush of current to the lamps results in frequent burnouts.

No matter whether the car is running at 12 or 40 miles an hour, the Waynelite automatically keeps the light always steady, uniform and bright, The lamps are connected to the transformer in multiple so that failure of one does not affect the other lamp which still maintains a constant light.

Because of its small size and waterproof construction, the Waynelite can be mounted out of the way on the dash or under the footboard.

Send for descriptive literature on this "Safety First" light regulation that every Ford owner should put on his car.

All Nite Lite—"Some Light All Night"

This is a popular convenience that fits in any standard lamp socket and occupies no more space than an ordinary forty-watt lamp. It fills the demand for economical all night lighting of

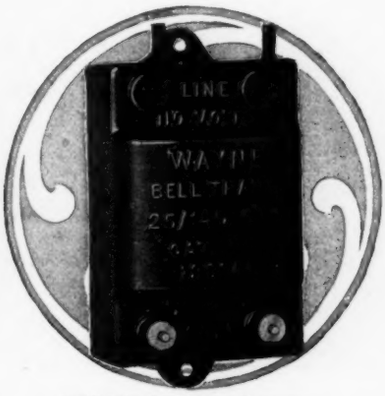
House Numbers	Cellars
Hospital Rooms	Stairways
Babies' Rooms	Porches
Fire Alarm Boxes	Halls

and other places where "some light all night" is desirable.

The All Nite Lite means to the consumer convenient lighting at small cost, to the dealer an easy sale involving a satisfactory profit and to the lighting company a highly desirable off-peak load which could not be secured on any other basis.

The All Nite Lite is adapted to any alternating current supply circuit within 100 to 125 volts and 50 to 140 cycles.

Ask for Flyer B-3341.



Bell Ringing Transformer

The Wayne Bell Ringing Transformer is adapted to every Bell ringing requirement.

It is recommended for operating doorbells, annunciators, door openers, thermostats, buzzers and similar devices.

The household size (Catalogue 190546) will not burn out on short circuit, complies with the National Electrical Code and is approved. It puts an end to all bell troubles arising from the limitations or deterioration of dry batteries and should have a place in all house-wiring specifications.

Ask for flyer B-3350.

General Electric Company

General Office: **Schenectady, N. Y.**

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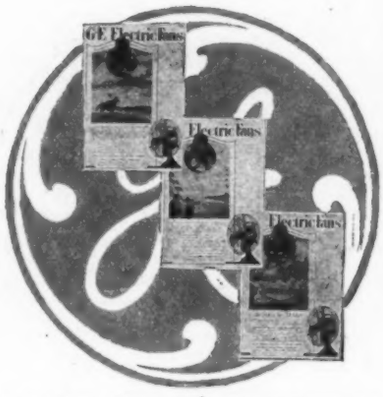
6238

This Trade Mark The Guarantee of Excellence on Goods Electrical.

This Trade Mark The Guarantee of Excellence on Goods Electrical.

Why You Should Sell G-E Fans

G-E Type of Ceiling Fan



Over Seven Million Fan Advertisements

G-E Desk and Bracket Fan

While a fan may be used for a variety of purposes, its most ordinary use is to agitate the air for coolness.

For such service in large rooms or commercial and manufacturing establishments, the G-E ceiling fan will be found ideal. This type of fan is made in various sizes, all of superior quality and finish.

They are furnished regularly for either direct or alternating current of all standard voltages and frequencies and may also be maintained in a variety of special finishes.

Write our nearest office for prices and further information.

The advertisements shown above are appearing this summer in more than a score of nationally-distributed magazines whose circulation aggregates over seven million copies.

Any G-E Fan dealer can tie up with this broad national publicity by advertising fans in his own city.

Ample assistance for such work is offered G-E dealers in the form of printed matter for consumer distribution, newspaper electrotypes and advertising advice. Those who sell G-E Fans receive regularly a live newspaper of trade suggestions to enable them to keep in constant touch with the latest sales helps and merchandising plans.

Let us show you how to sell more G-E Fans this year—address the Electrical Advertiser.

G-E 12 and 16-inch four-blade fans are especially adapted to office use, and, among other advantages, possess that of being easily converted from desk to bracket type.

These desk-bracket fans are also made in 8 and 9-inch sizes and for direct and alternating current of all standard voltages and frequencies.

The General Electric Company also manufactures a six-blade 12 and 16-inch residence fan. Because of its extreme quietness it is also suitable for hospitals and similar institutions.

G-E Fans are made in both oscillating and stationary types. They are of the highest quality and are built for service.

General Electric Company

General Office: **Schenectady, N. Y.**

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6239

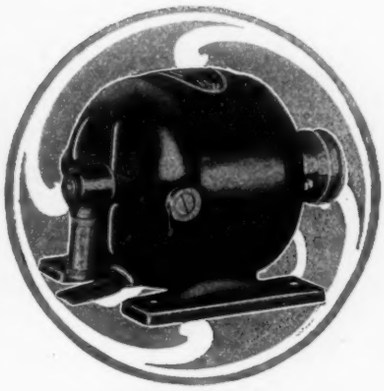
This Trade Mark The Guarantee of Excellence on Goods Electrical.

This Trade Mark The Guarantee of Excellence on Goods Electrical.

Fractional H/P Motors

Type SA
Alternating Current
Motor

Repulsion
Induction Motors
½ to ¾ H. P.



1/200 H. P. Motors
Series wound for
A. C. and D. C.

Any devices equipped with SA alternating current motors will take without any change the SD direct current motors of the same H.P. ratings.

Both the A.C. and D.C. are exactly the same in end flanges, distance between holes in feet, height, length and every other external dimension; moreover, both the A.C. and D.C. are practically identical in service. This interchangeability is of immense advantage when the motor driven machines are shipped to different cities.

Sizes of this type are:
1800 r.p.m. 1/20 to 3/4 h.p.
1200 r.p.m. 1/30 to 1/2 h.p.

Correspondence is invited on the SA and SD Types of F/H Motors.

These motors start as repulsion motors which give them a high starting torque at low current; after the load is brought to operating speed the motor operates as an induction motor.

A simple internal mechanism makes this change automatically and positively.

No auxiliary device such as starting box or starting resistance is required with this type RSA motor. This is the ideal fractional h. p. motor to use on any machine where the starting load is heavy and the incandescent lighting service must be kept normal.

Their light weight and high speed make them especially serviceable on portable devices such as vacuum cleaners, vibrators, etc.

Speeds 1800 to 3000 r.p.m. in outputs from 1/200 to 1/15 h.p.

Our extensive line of F/H Motors enables us to meet practically every requirement, but if a special motor is needed, we are prepared to furnish it.,

Our equipment and experience in making hundreds of thousands of such small motors is at your service in selecting and building the motor which will operate your machine with the greatest of satisfaction to both yourself and the ultimate user.

General Electric Company

Fort Wayne Dept. **Fort Wayne, Ind.**

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6240

This Trade Mark The Guarantee of Excellence on Goods Electrical.

They're off!

Signalling Drivers

A Real Lighting Achievement

The Flood Lighting of Sheepshead Bay Automobile Speedway

TO light a two mile speedway and a 160 acre interior field with a light intensity never before attempted on so large a field is proof positive of the almost unlimited possibilities of flood lighting.

This novel use of 370 G-E Projectors indicates what is probably the largest single application of its kind ever attempted.

General Electric Company

General Office: Schenectady, N. Y.

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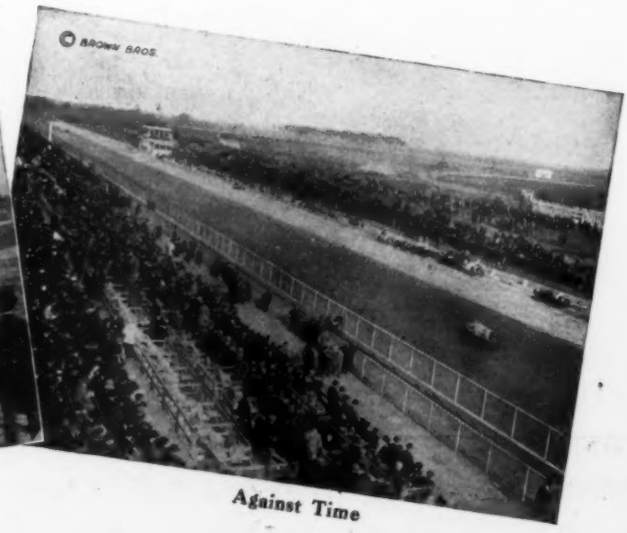
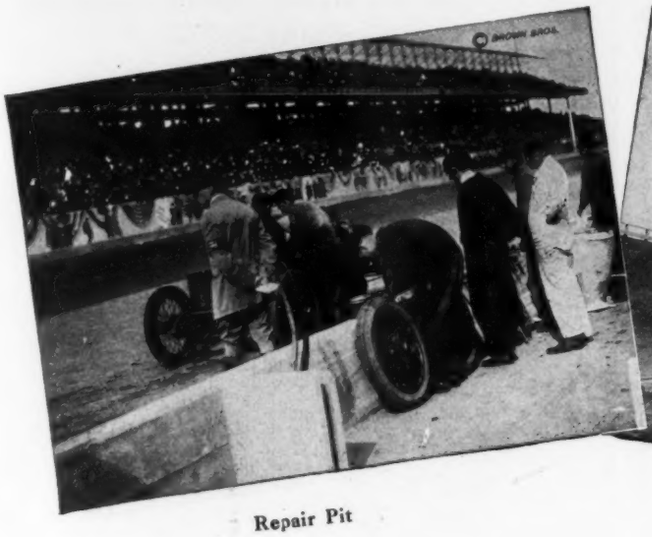
6241-A

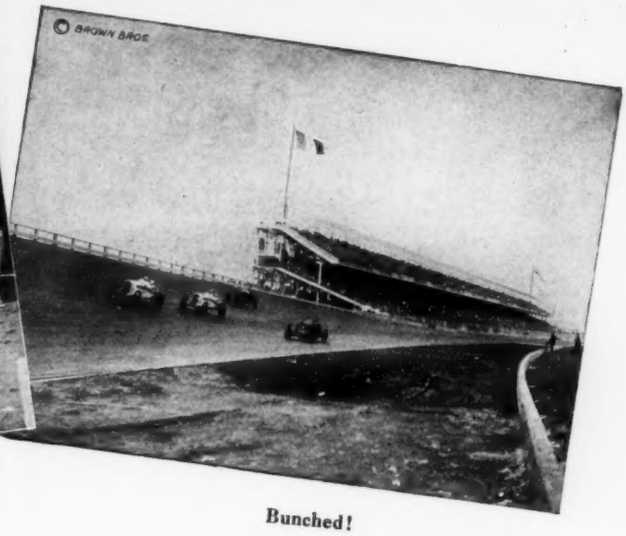
The Grand Stand



Against Time



Repair Pit



Bunched!

Flood Lighting the Big Speedway

The largest illuminated area of its kind in the world

THE flood lighting of the Sheepshead Bay Automobile Speedway and the 160 acre interior field make possible the holding of night time automobile races, military maneuvers, etc., on the largest illuminated area in the world.

Three hundred and seventy 500-watt EDISON MAZDA C Lamps in G-E Projectors furnish an abundance of light.

Edison Lamp Works
of General Electric Company
Harrison, N. J.

6241-B

The Winner

Spectators' Cars

Weston

MINIATURE PRECISION D. C. INSTRUMENTS

The same degree of mechanical and electrical excellence which has won pre-eminence for the larger Weston Models is embodied in these wonderful little masterpieces of the instrument maker's art. The finest watch is a less striking example of perfection in refined workmanship. They are accurate, dead-beat, extremely sensitive. They are shielded against external electrical and magnetic influences. Despite their great refinement in workmanship, they are very substantially constructed and have the longest scale ever provided in instruments of similar size. In short, they are the finest development of small instruments of the pivoted moving coil, permanent magnet type. And the prices are low.

The several models and ranges offer a selection from over 300 different combinations. The Switchboard Instruments are listed in bulletin No. 20 and Portable Instruments in bulletin No. 501. They will be mailed on request.

Weston Electrical Instrument Co.
19 Weston Ave., Newark, N. J.

New York	Richmond
Boston	Denver
Philadelphia	Detroit
Buffalo	San Francisco
Cleveland	Toronto
Chicago	Montreal
Cincinnati	Winnipeg
St. Louis	Vancouver

Model 267
Switchboard Type

PULL THE SIMPLEX STRING

EVERY PAPER WRAPPED COIL of Simplex Wire has it.

SIMPLEX WIRE & CABLE CO
MANUFACTURERS
201 DEVONSHIRE ST. BOSTON
CHICAGO SAN FRANCISCO

151

THE STANDARD FOR RUBBER INSULATION

OKONITE

TRADE MARK REG. U.S. PATENT OFFICE

OKONITE

Quality has taught users to expect and exact a high standard of service performance.

Okonite never disappoints.

The
Okonite Company
253 Broadway New York

60

INDIANA RUBBER AND INSULATED WIRE CO.

Paranite Rubber Covered Wires and Cables

IF IT'S **PARANITE** IT'S RIGHT

More Than Code Requires

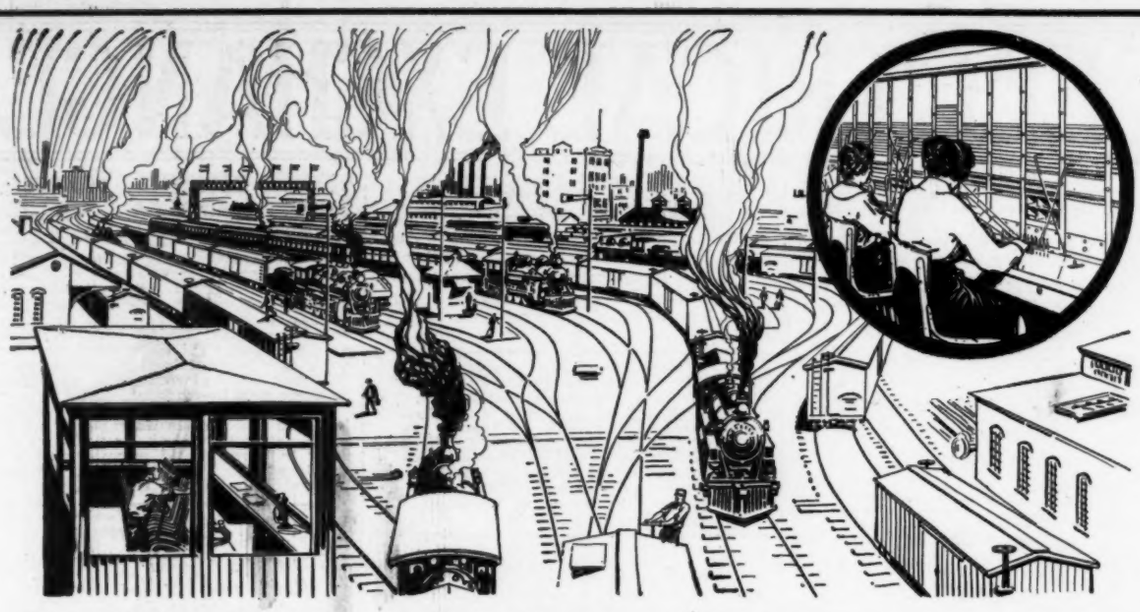
PARANITE

Underground, Aerial, Submarine and Inside use

Telephone, Telegraph and Fire Alarm Cables, Lamp Cords, Portable Cords and Ignition Cables

Factory and General Offices:
JONESBORO, IND.

Chicago Branch: 210 Desplaines St.
Chicago, Illinois



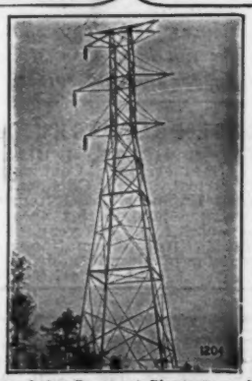
The switchboard operator is the train dispatcher of the telephone service, routing long distance and toll calls over the best and quickest talking circuits, following the carefully prepared traffic plans of the Bell engineers.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

One Policy *One System* *Universal Service*

AMERICAN BRIDGE COMPANY
HUDSON TERMINAL-30 CHURCH STREET, NEW YORK

Manufacturers of Steel Structures of all classes particularly BRIDGES AND BUILDINGS



Transmission Towers at Birmingham, Ala. Alabama Power Co.

SALES OFFICES

NEW YORK, N. Y., 30 Church Street
Philadelphia, Pa., . Widener Building
Boston, Mass. . . John Hancock Bldg.
Baltimore, Md., Continental Trust Bldg.
PITTSBURGH, PA. . . Frick Building
Rochester, N. Y. . . . Powers Block
Buffalo, N. Y. . Marine National Bank
Cincinnati, Ohio. Union Trust Building
Atlanta, Ga. . . . : Candler Building
Cleveland, Ohio . Rockefeller Building
Detroit, Mich., Beecher Ave. & M. C. R. R.
CHICAGO, ILL., 208 South La Salle St.
St. Louis, Mo., Third Nat'l Bank Bldg.
Denver, Colo., First Nat'l Bank Building
Salt Lake City, Utah, Walker Bank Bldg.
Duluth, Minn. . . . . Wolvin Building
Minneapolis, Minn., 7th Ave. & 2nd St., S. E.

Pacific Coast Representative:
U. S. Steel Products Co. Pacific Coast Dept.
SAN FRANCISCO, CAL., Rialto Building
Portland, Ore. . . . . Selling Building
Seattle, Wash., 4th Ave. So. Cor. Conn. St.

Export Representative:
United States Steel Products Co., 30 Church St., N. Y.

ELECTRICAL EXCHANGE

POSITIONS WANTED

The rate for "Positions Wanted" advertisements is two cents per word, minimum charge 50 cents an insertion, payable in advance. Remittances and copy should reach this office not later than Monday, 12 o'clock noon, for the next succeeding issue.

Replies may be sent in care of Electrical Review and Western Electrician, 608 So. Dearborn Street, Chicago, or 13-21 Park Row, New York.

POSITION WANTED— By young man, 20; have 2 years' A. C. industrial experience; have I. C. S. diploma (complete electrical); want P. M. hours, so that I may attend high school during A. M. for next two years. Open June 15. Address No. 2050, Electrical Review and Western Electrician, Chicago.

POSITION WANTED— As chief clerk or office manager with central station company. Have held like position with large company for three years. Very best of references. Married. Minimum salary, $125. Address No. 2054, Electrical Review and Western Electrician, Chicago.

POSITION WANTED— Electrician with 9 years' practical experience and several years of institute courses, wants position as all-round man in plant using D. C. wiring, installing, repairing. Address No. 2058, Electrical Review and Western Electrician, Chicago.

POSITION WANTED— With electric light and power company; 16 years' experience in all branches of the business; married; age 36 years. Address No. 2056 Electrical Review and Western Electrician, Chicago.

HELP WANTED

The rate for "Help Wanted" advertisements is three cents a word, minimum charge $1.50 an insertion, payable in advance. Remittances and copy should reach this office not later than Monday, 12 o'clock noon, for the next succeeding issue.

Replies may be sent in care of Electrical Review and Western Electrician, 608 So. Dearborn Street, Chicago, or 13-21 Park Row, New York.

WANTED— First class machinist to superintend a manufacturing shop of a dozen men. Salary $125 per month. Address: No. 2055, Electrical Review and Western Electrician, Chicago.

WANTED— Traveling Salesmen for Indiana and Michigan. Electrical Supplies. State age and experience and salary expected. Address No. 2059, Electrical Review and Western Electrician, Chicago.

WANTED— Experienced inside wiremen at once; open shop; 45c per hour. Address A. L. Swanson Company, Evansville, Ind.

MISCELLANEOUS

The rate for "Miscellaneous" advertisements is three cents a word, minimum charge of $1.50 an insertion, payable in advance. Remittances and copy should reach this office not later than Monday, 12 o'clock noon, for the next succeeding issue.

FOR SALE— Complete Storage Battery and Individual Lighting Plant Business. Price reasonable for quick sale. Address B. R., Electrical Review and Western Electrician, Chicago.

DISCARDED LIGHTING EQUIPMENT

Wanted—Arc lamps, arc machines, transformers, and generators. Write what you have to offer. Meltreger & Company, 1718 Washburne Ave., Chicago, Ill.

WANTED— By large manufacturer of a staple electrical line, which is handled by every Electrical Hardware and Automobile Accessory Store, dignified representation in the Southern, Southwestern, Middle West and far Western territories. Experienced salesman anxious to handle a standard quality line at a liberal commission will find this proposition worth investigating. Correspondence strictly confidential. Address No. 2057, Electrical Review and Western Electrician, Chicago.

FOR SALE— One reciprocating engine direct connected to 400 kw., 220 volt generator. Equipment includes switchboard. Two 200 horsepower B. & W. horizontal water tube boilers. One General Electric rotary converter, 500 kw., 600 volt. Details on the above equipment furnished on application to T. R. Harber, Purchasing Agent, Kansas City Light & Power Company.

NATIONAL ELECTRICAL EXCHANGE

List the used apparatus you have for sale.

List the used apparatus you wish to buy. We introduce the buyer and seller.

No charge for listing.

National Electrical Exchange,
145 Spring St., Aurora, Ill.

CASH REWARD

for first information as to the location and leading to the purchase of good second-hand electric motors.

V. M. NUSSBAUM & CO.,
Ft. Wayne - - - Indiana

America's Headquarters for

Second Hand Electrical Machinery

Overhauled in our shops and sent out "as good as new" with a satisfactory guarantee. We buy—sell—repair—rent and exchange—and are always ready for a trade. No quantity too large. Send for our "Monthly Bargain Sheet," showing net prices.

GREGORY ELECTRIC CO.

GENERAL ELECTRICAL BUSINESS FOR SALE IN CALIFORNIA CITY OF 90,000

A man walking upon crutches is a mighty poor salesman. I own the controlling interest in a large electrical store with fine store and stock, and salesroom right up to the minute. Stock will inventory about $8,000. I will sell all or controlling interest. A man to handle this ought to be a good salesman. My junior partner is highly qualified and good all around man but his time is mostly devoted to outside work, if agreeable he would like to retain his position and investment.

You can step right into an old established business and double its capacity at once.

Do not take up my time if you are not fully in earnest and mean business.

Address No. 2060, Electrical Review and Western Electrician, Chicago.

PROPOSALS

The rate for "Proposal" advertisements is fifteen cents per line, nonpariel measurement, payable in advance. Remittances and copy should reach this office not later than Monday, 12 o'clock noon, for the next succeeding issue.

TREASURY DEPARTMENT, Supervising Architect's Office, Washington, D. C., May 3, 1916.—SEALED PROPOSALS will be opened in this office at 3 p. m., May 31, 1916, for extension of conduit and wiring and gas piping systems and lighting fixtures in the United States Post Office and Court House at Peoria, Illinois, in accordance with drawings and specification, copies of which may be had at this office or at the office of the Custodian, Peoria, Illinois, in the discretion of the Supervising Architect. Jas. A. Wetmore, Acting Supervising Architect.

TREASURY DEPARTMENT, Supervising Architect's office, Washington, D. C., May 10, 1916.—Sealed proposals will be opened in this office at 3 p. m., June 6, 1916, for a conduit and wiring system, lighting fixtures, etc., in the United States courthouse, post office, etc., Oshkosh, Wis., in accordance with drawings and specifications, copies of which may be had at this office or at the office of the custodian, Oshkosh, Wis., in the discretion of the Supervising Architect.—James A. Wetmore, Acting Supervising Architect.

EDUCATIONAL

The rate for "Educational" advertisements is fifteen cents per line, nonpariel measurement, payable in advance. Remittances and copy should reach this office not later than Monday, 12 o'clock noon, for the next succeeding issue.

ROSE POLYTECHNIC INSTITUTE

TERRE HAUTE, INDIANA. A College of Engineering. Courses in Mechanical, Electrical, Civil, Chemical and Architectural Engineering. Extensive shops, well-equipped laboratories in all departments, expenses low. 33d year. For catalog containing full information and professional register of alumni, address

C. L. Mees, President.

BOUSTEAD ELEC. & MFG. CO.
NEW AND USED ELECTRICAL MACHINERY
REPAIRING
ARMATURE AND TRANSFORMER WINDING
215 1st Avenue North
MINNEAPOLIS, MINNESOTA

GALES COMMUTATOR COMPOUND
You who are Troubled with Sparking and Cutting of Commutators to Use — The only article that will prevent sparking will keep the commutator in good condition and Prevent Cutting. Absolutely Will Not Gum the Brushes. It will put that high gloss on the commutator you have so long sought after.
25 Cents per Stick $5.00 per Dozen
FREE Sample Stick
For Sale by All Supply Houses, or
E. Gales & Co., Sole Mfrs., R. 305, Times Bldg., 192 N. 5th Av., Chicago.

W. S. BARSTOW & CO.

INCORPORATED

CONSULTING AND CONSTRUCTING

ENGINEERS

PUBLIC SERVICE PROPERTIES
FINANCED AND MANAGED

50 PINE STREET, NEW YORK

H. M. Byllesby & Company

ENGINEERS and MANAGERS

Tacoma	CHICAGO	New York
Gas Bldg.	208 So. La Salle St.	Trinity Bldg.

Purchase, Finance, Design, Construct and Operate Electric Light, Gas, Street Railway and Water Power Properties.

EXAMINATIONS AND REPORTS

Utility Securities Bought and Sold

ELECTRICAL
MECHANICAL
CONSULTING

Directory of Engineers

CONTRACTORS
SPECIAL
INTERESTS

American District Steam Company
Engineers and Contractors for Central Station Heating Systems
General Offices and Works
North Tonawanda, N. Y.
New York West St. Bldg.
Chicago First Nat'l Bk. Bldg.
Seattle Hoge Bldg.

THOMAS HOWE
E. E. Cornell, 1896 LL.B. N. U. Law School, 1904
PATENTS
Long practical experience as Engineer and Patent Attorney with prominent electrical Companies including soliciting electrical patents and prosecuting electrical cases before the courts.
No. 2 Rector Street NEW YORK

CHARLES L. PILLSBURY
CONSULTING, MECHANICAL and ELECTRICAL ENGINEER
Consulting Engineer to Minnesota State Board of Control
Suite 805, Metropolitan Life Bldg.
MINNEAPOLIS, MINN.

THE ARNOLD COMPANY
ENGINEERS
CONSTRUCTORS
Electrical—Civil—Mechanical
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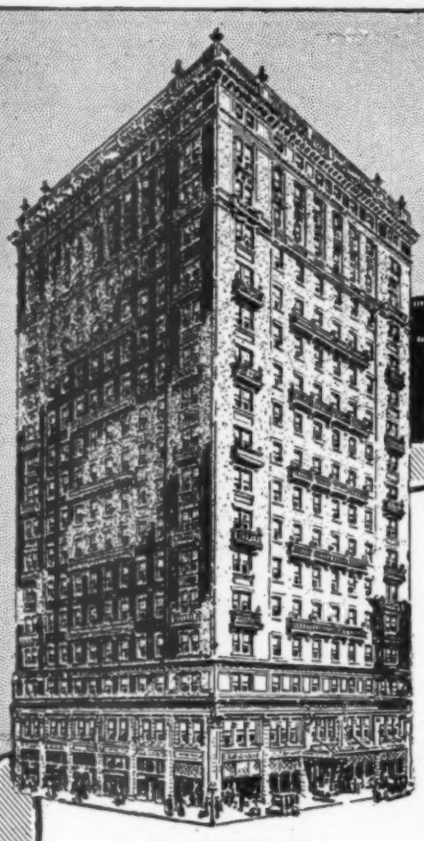

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THE CENTER OF POPULATION: Within five hundred miles of Cleveland is more than one-half the total population of the United States and Canada. Cleveland is within a night's ride of the Atlantic Seaboard and the Mississippi River, and is on the principal travel highway between New York and Chicago. Iron ore, copper, stone, lumber, hides, wool, oils and other raw material are brought to Cleveland from nearby sources at a very low cost of transportation.

SERVED BY NINE RAILROADS: All the Eastern trunk lines enter Cleveland, including nine different railroads. Transportation cost is low and facilities for shipping abundant. By boat, Cleveland has practically EXPRESS service at FREIGHT RATES to the principal ports on the Great Lakes during eight months of the year.

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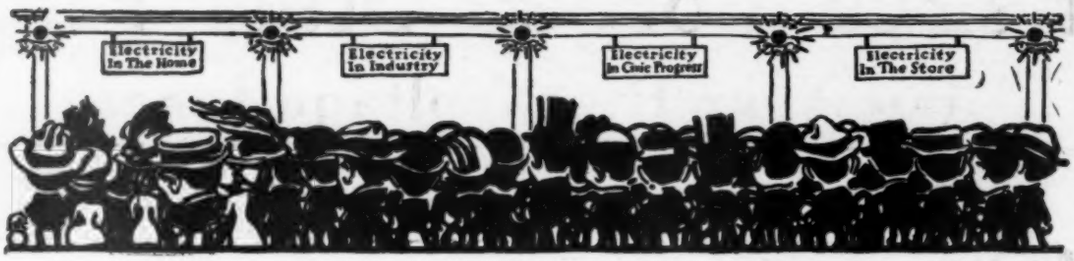

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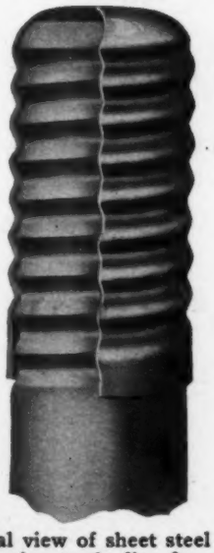
Phantom view of short shank pin for Bo-Arrow Arm



Sectional view of sheet steel thimble, showing cork disc for taking up expansion of pin and maintaining a secure seat for the insulator.

Most transmission line failures are caused by punctured insulators or broken pins.

You can eliminate these two sources of expensive shut-downs by using Peirce Steel Pins with the new sheet steel separable thimbles.

Several recent investigations of insulator failures by groups of operating engineers have shown that most of the insulators punctured by abnormal line voltages have had the old type of cast iron thimble cemented in them for some time, and that the susceptibility to puncture of a given insulator depends not on the length of time it has been in actual line service, but on the length of time it has had a cast iron thimble cemented in it and has accordingly been subjected to the mechanical stresses set up by the expansion and contraction of this comparatively large body of metal. These stresses do not rupture the porcelain nor produce any visible result, but they change the molecular structure of the porcelain so as to lower its insulating value to a point where it is punctured by the first high voltage stress applied to it by a lightning discharge or a surge. This was formerly called **electrical fatigue,** but it has been pretty definitely determined to be of mechanical origin.

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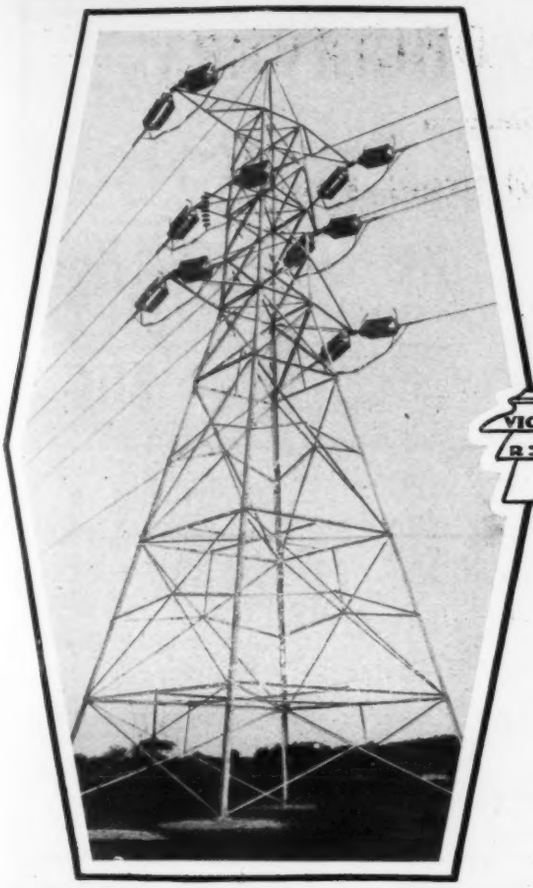

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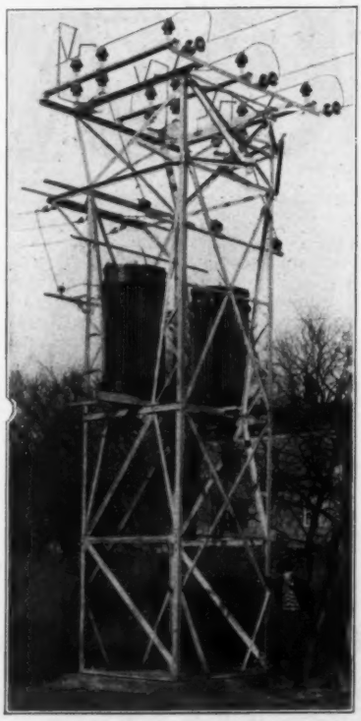

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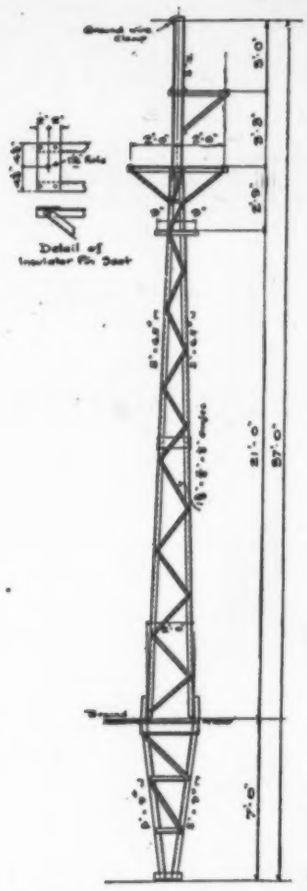

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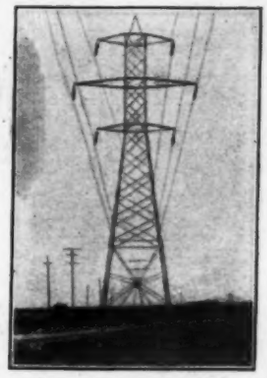

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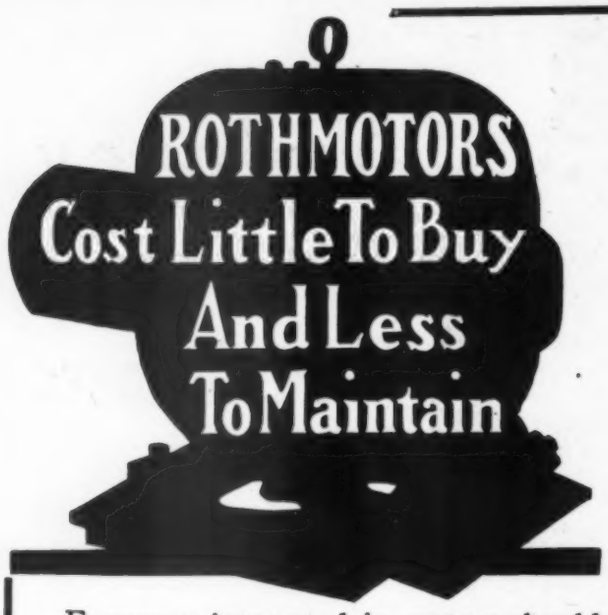

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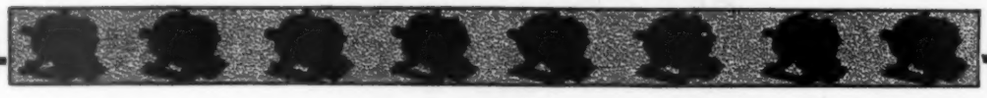

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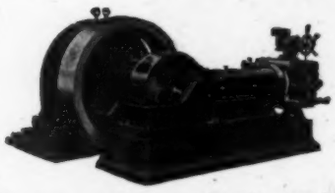

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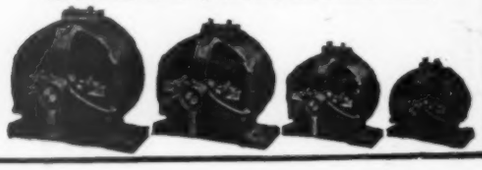
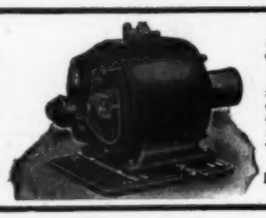
The Electrical Machinery Sales Co., 836 Webster Building





Glad to Take Up With You

any questions involving the use of the right dynamos in the right places.

Eck Dynamos

are conservatively rated, honestly constructed, fully guaranteed, have a 12 years' record of successful performance behind them, and may be had in 30 different frame types —.035 to 15 k. w.

Send for Bulletin No. 39.

Eck Dynamo and Motor Co.
Belleville, N. J.

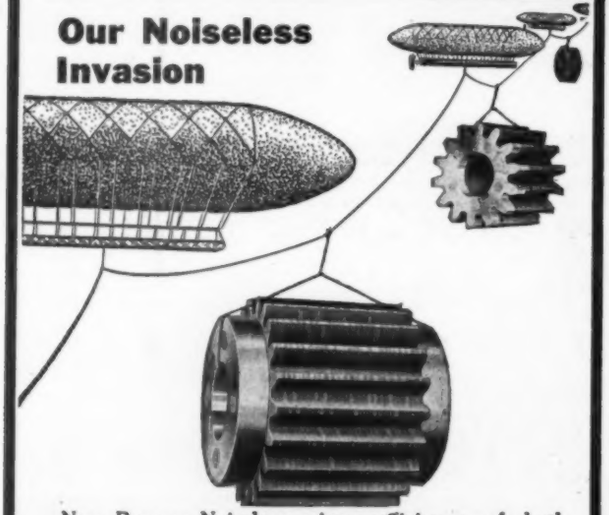
ALTERNATORS

Vertical Type

67% Larger Income—Same Cost. For direct coupling to water-wheel shafts for Power and Lighting Service. 20 K.W. to 1,000 K.W.

Electric Machinery Company
Minneapolis - - Minn.

Our Noiseless Invasion



New Process Noiseless Pinions started their war on noise twenty-seven years ago.

Throughout the land they are winning consistently, for, in gear driving, efficiency of both men and machines are always on the side of quiet.

Strong, durable and more used than all other makes of non-metallic pinions put together.

Ask for our book, "Noiseless Gear Driving"

NEW PROCESS IS TO ALL OTHER RAWHIDE AS STEEL IS TO IRON

NEW PROCESS GEAR CORPORATION

SYRACUSE, N. Y

CANADIAN AGENTS: Robert Gardner & Son, Ltd., Montreal 109

"Martin" Rotary Converter

The garage and movie man's best friend. Delivers 60 to 220 volts D. C. from 110, 220, 440 volt, 25, 30 or 60 cycle A. C. lines. Ratio of output to input is high. Simple to operate—skilled help not required. Many installed in industrial plants for electric hoist, lifting magnet and electro-magnetic tool operation.

Write for full particulars

Northwestern Electric Company

613 W. Adams St., Chicago 1457 Broadway, New York
216 Bishop St., Montreal, Quebec
308 Tyrrel Bldg., Toronto, Ontario

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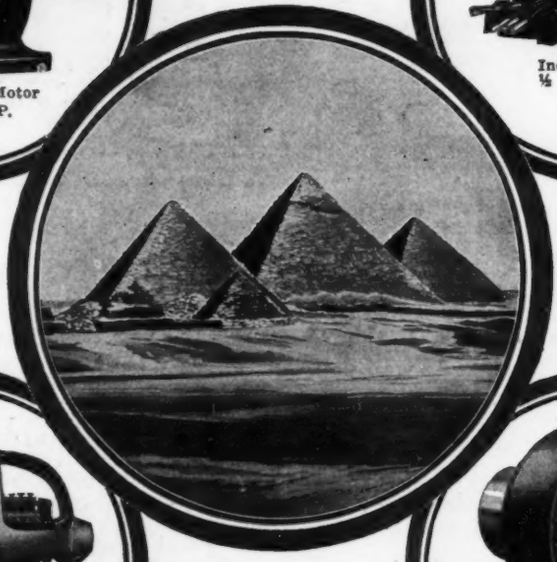
MOTORS, GENERATORS, TRANSFORMERS - IN ALL SIZES, IN ALL TYPES, FOR ALL PURPOSES

LIKE THE PYRAMIDS BUILT TO LAST

Form L, D.C. Motor
1-5 to 7.5 H.P.

Form LL, D.C. Motor
1-20 to ¼ H.P.

Induction Motors
½ to 300 H.P. and Larger

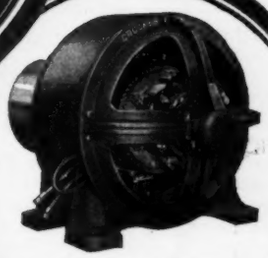


Motors in all sizes

Motors for all purposes

Form I, D.C. Motor
3¾ to 50 H.P.

Form SS, A.C. Motor,
1/20 to ¼ H.P.



Form H, D.C. Motor
25 to 225 H.P.

Write for Bulletins

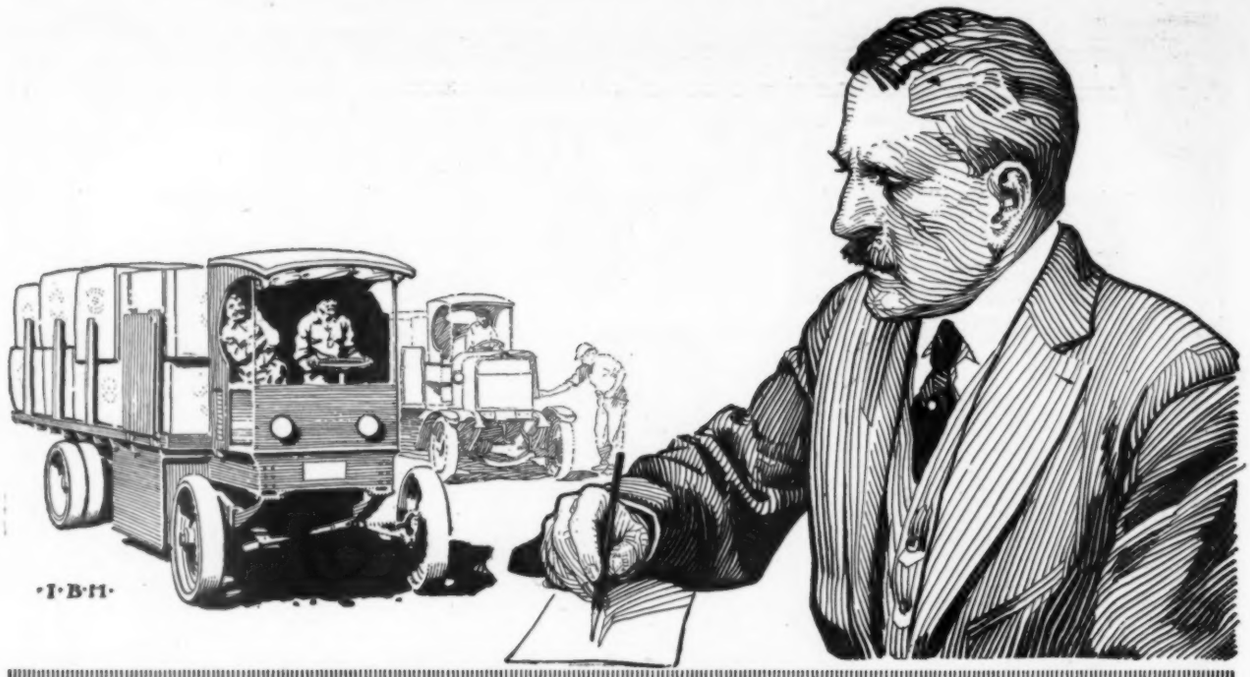
CROCKER-WHEELER

BALTIMORE
BIRMINGHAM
BOSTON
CHICAGO
CINCINNATI
CLEVELAND
DENVER
DETROIT

COMPANY
AMPERE, N.J.

NEW HAVEN
NEWARK
NEW YORK
PHILADELPHIA
PITTSBURG
ST. PAUL
SAN FRANCISCO
SYRACUSE

STURDY LITTLE MOTORS THAT WITHSTAND THE LAYMAN'S ABUSE



Is the Gas Truck the Economic Equal of the Electric in City and Suburb?

City and suburb is the key to that question. We grant, at once, its *rightful* field to the gas truck. As well deny the gas pleasure car's fitness to make long runs and few stops as to argue against the gas truck in its logical field.

But think of the gas truck on short hauls with many stops.

Does the chauffeur stop his engine while the gas truck waits for the traffic man's signal?

The electric truck consumes no power except when moving.

And when the traffic man gives the signal, which truck gets under way first?

Of two trucks—one gas, the other electric—started at the same time over a short haul in congested traffic with many stops, the electric will lead the way home nine times out of ten.

Tires and "fuel" are big items in trucking. On electrics tires generally outrun their guaranteed mileage—and gasoline is going up fast.

The dependence you can put in your trucks has a lot to do with their economy. During the first three years—the best years in a gas truck's life—the average gas truck is out of commission four times as much as a G. V. Electric.

You'll understand why if you'll compare the complicated mechanism of a gas engine with the simple motor of an electric—about as complex as an electric fan.

These statements are not mere generalities—every one has been worked out time and again in practically every kind of business during the fifteen years we've been making G. V. Electric Trucks.

The results we can quote you are not claims, they're the figures at the bottom of the cost expert's columns.

We can prove to you that, in 85% of all city and suburban trucking, the G. V. Electric Trucks are the most economical—the most efficient.

If we couldn't do so, how could we have over 22% of all the motor trucks in New York City? You know what it means to try to "get" New York.

Our records of performance cover 75 industries and 15 years. They probably contain figures that apply to *your* business. They are yours—for the asking. Just tell us your line of business and see if we can't save you money.

This is one of a series of advertisements we are running in the national magazines and metropolitan newspapers. We are educating the merchants and manufacturers of *your* city to the value of the electric truck.

Have you done *your* part to secure the benefit of this advertising for *your* "off-peak"? Do you set the truckers of *your* city the example of using electric trucks; or are you wasting money and opportunity by using gas vehicles?

If you want to know more of the marvelous strides the G. V. Trucks are making under central station cooperation in many major cities, write us for further particulars and you will get them at once in convincing quantities—and to the point.

Don't fail to see our N. E. L. A. exhibit in space 47 at the Auditorium

GENERAL VEHICLE COMPANY, Inc.

General Office and Factory: Long Island City, New York

NEW YORK CHICAGO BOSTON PHILADELPHIA

Six Models: 1,000 to 10,000 pounds capacity **Dealers in open territory are invited to correspond**

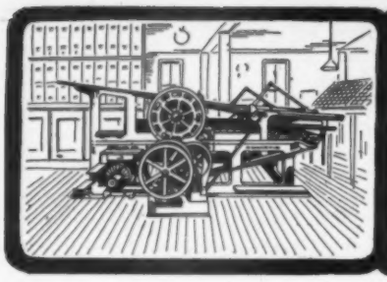
1662

WE take this occasion to thank the central station companies throughout the United States for the splendid co-operation they have extended the past year toward the promotion of the electric vehicle industry. And we are fully appreciative of the important part they have played in the realization of a 300 per cent increase in the sales of electric pleasure cars during the first quarter of 1916 as compared to the first quarter of 1915.

ANDERSON ELECTRIC CAR COMPANY
MAKERS OF DETROIT ELECTRICS
DETROIT MICHIGAN

THE Detroit ELECTRIC

WORLD'S LARGEST BUILDERS OF ENCLOSED AUTOMOBILES
(155)



Publisher to Advertiser

N. E. L. A. Convention Number

May 20, 1916

The National Electric Light Association Convention Number—this issue—strikes a High Point in Electrical Journalism.

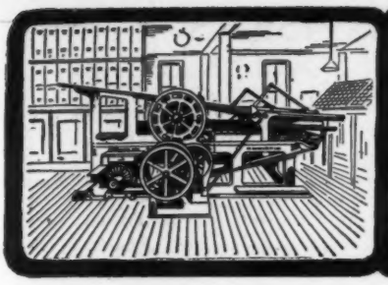
The Splendid Array of Extraordinary Articles included in the Reading Pages is Practically the Last Word upon each of the Important Subjects discussed.

There may be somewhere someone who might write more entertainingly or with greater authority upon these subjects—but We Don't Know Where They Are! The Men Behind the Issue are On the Firing Line. They are Doing Things. Their words may be accepted as coming straight out of Great Experience and Practical Utilization of Practical Ideas.

The Advertising Pages are Right in Line. They are Tone-True and Look Good, and are Written for the Honest, Business-like Consideration of the Men for Whom the Paper is Published—the Live Ones of the Industry: the Super-Serious; the More-Than-Usually Intelligent; the Big Boys susceptible to being Favorably Affected by Honest Advertising.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

608 South Dearborn St.
CHICAGO



Publisher to Advertiser

Convention Report Number

May 27, 1916

If your Reservation for Advertising Space is not in, Take a Good Look at this issue, and then Speed the Specification. Next week's issue, along with this Convention Number have a way of being referred to again and again.

Those Who Did Not Get There will be on the Watch for Early Information. The First Thing the Convention Attendant will do when he gets back home will be to Check Up and See What Kind of a Report We Made of It!

The Report Will be There! All of it. From the Arrival of the Trains to the Dismantling of the Big Exhibit! And a Lot of Other Interesting and Valuable Material Crowded Out of the Convention Number.

Advertising Forms Close May 24. You Have Time to Repeat or Order an Entirely New Presentation. But we Must Know Promptly.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

608 South Dearborn St.
CHICAGO

CLASSIFIED INDEX OF ADVERTISERS

ADAPTERS, Lamp
Benjamin Electric Mfg. Co.
Bryant Electric Co.
Faries Mfg. Co.
General Electric Co.
Harvey Hubbell, Inc.

ADJUSTERS, Cord and Lamp.
McGill Mfg. Co.
Trumbull Electric Mfg. Co.

AIR COMPRESSORS, Motor Driven.
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Emerson Electric Mfg. Co.
Fairbanks, Morse & Co.
General Electric Co.

ALTERNATORS.
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Fairbanks, Morse & Co.
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General Electric Co., Ft. Wayne Dept.
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Westinghouse Electric & Mfg. Co.

AMMETERS AND VOLTMETERS.
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Esterline Co.
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Metropolitan Engineering Co.
Roller-Smith Co.
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Westinghouse Electric & Mfg. Co.
Weston Electrical Instrument Co.

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Klein & Sons, Mathias.
Ohio Brass Co.
Oshkosh Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

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Menominee Electric Mfg. Co.
Ostrander & Co., W. R.
Western Electric Co.

ASBESTOS.
General Bakelite Co.

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Central Electric Co.
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Faries Mfg. Co.
General Electric Co.
Hart Mfg. Co.
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Mueller & Co., R. S.
Pass & Seymour, Inc.
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Westinghouse Electric & Mfg. Co.

ATTACHMENTS, OUTLET BOX.
C. & P. Electric Works.

AUTO STARTERS (For Starting A. C. Motors).
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Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
Fairbanks, Morse & Co.
General Electric Co.
Wagner Elec. Mfg. Co.
Ward-Leonard Electric Co.
Westinghouse Electric & Mfg. Co.
Western Electric Co.

AUTOMOBILES, Electric.
Anderson Electric Car Co.
General Vehicle Co.

AUTOMOBILE LIGHTING SYSTEMS.
General Electric Co.
Wagner Elec. Mfg. Co.
Ward Leonard Electric Co.
Westinghouse Electric & Mfg. Co.

BANDS, PIPE.
American Bridge Co.

BASES AND SUB-BASES, Snap Switch.
Pass & Seymour, Inc.

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Fairbanks, Morse & Co.
Manhattan Electrical Supply Co.
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Nungesser Carbon & Battery Works of National Carbon Co.
United Battery Corporation.
Usona Mfg. Co., Inc.
Western Electric Co.

BATTERIES, Medical.
Manhattan Electrical Supply Co.
Menominee Electric Mfg. Co.
Ostrander & Co., W. R.

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Electric Storage Battery Co.
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Venus Electric Lamp Co.

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Manhattan Electrical Supply Co., Co.

BATTERY CONNECTORS.
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Hyatt Roller Bearing Co.

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Ostrander & Co., W. R.

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Manhattan Electrical Supply Co.
Menominee Electric Mfg. Co.
Schwarze Electric Co.
Western Electric Co.

BELT FASTENERS.
Bristol Co.
Flexible Steel Lacing Co.

BENDERS, Conduit and Pipe.
Fey Specialty Co., The.
Rittenhouse Co., A. E., The.
Thomas & Betts Co.
Western Electric Co.

BINDING POSTS.
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Manhattan Electrical Supply Co.
Menominee Electric Mfg. Co.
Western Electric Co.

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Hart Mfg. Co.
Metropolitan Engineering Co.

BLOWERS AND EXHAUSTERS.
Emerson Electric Mfg. Co.
Fairbanks, Morse & Co.
General Electric Co.
Sprague Electric Works.

BLOWERS, Organ.
Crocker-Wheeler Co.
Emerson Electric Mfg. Co.

BOILERS, Steam.
Babcock & Wilcox Co.
Fairbanks, Morse & Co.
Murray Iron Works Co.

BOLTS, EXPANSION.
Hubbard & Co.

BONDS, SHARES AND SECURITIES.
Electric Bond & Share Co.
Corporation Finance Co.

BOOKS, Technical.
Electrical Review Pub. Co.

BOOSTERS.
Allis-Chalmers Manufacturing Co.
Crocker-Wheeler Co.
General Electric Co.
Ridgway Dynamo & Engine Co.
Westinghouse Electric & Mfg. Co.

BOXES, Conduit.
Adapti Co.
Benjamin Electric Mfg. Co.
Bryant Electric Co.
Central Electric Co.
Chicago Fuse Mfg. Co.
Columbia Metal Box Co.
Cutter Co.
Cutter Co., George.
Hart Mfg. Co.
Metropolitan Engineering Co.
National Metal Molding Co.
Ostrander & Co., W. R.
Phelps, James C. "J C P Cap-let."
Sprague Electric Works.
Thomas & Betts Co.

BOXES, Floor.
Central Electric Co.
Electrical Engineers Equipment Co.
General Electric Co.
Manhattan Electrical Supply Co.
Thomas & Betts Co.

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Columbia Metal Box Co.
D & W Fuse Co.
General Electric Co.
Metropolitan Engineering Co.
Standard Underground Cable Co.

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Bissell Co., F.
Brady, T. H.
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Columbia Metal Box Co.
Cutter Co., George.
D & W Fuse Co.
Delta-Star Electric Co.
General Electric Co.
Menominee Electric Mfg. Co.
Metropolitan Engineering Co.
Newgard & Co., Henry.
Palmer Elec. & Mfg. Co.
Standard Underground Cable Co.
Trumbull Electric Mfg. Co.
Trumbull-Vanderpool Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.

BRACES, Cross Arm.
Hubbard & Co.

BRACKETS, ARMS AND PINS (Iron).
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Brady Electric Mfg. Co.
Cutter Co., George.
Delta-Star Electric Co.
Electrical Engineers' Equipment Co.
Faries Mfg. Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.

BRACKETS, Pothead.
Electrical Engineers' Equipment Co.

BRAKES, Dynamo.
Cutler-Hammer Mfg. Co.

BRAKES, Electric.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Co.
Sundh Electric Co.
Western Electric Co.

BRAKES, Motor.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
Westinghouse Electric & Mfg. Co.

BRASS AND COPPER.
Bridgeport Brass Co.

BRIDGES.
American Bridge Co.

BRIDGES, RAILROAD AND HIGHWAY.
American Bridge Co.

BRIDGES AND TOWERS, COAL HANDLING.
American Bridge Co.

BRUSHES, Carbon and Graphite.
Calebaugh Self-Lubricating Carbon Co.
Central Electric Co.
General Electric Co.
Nungesser Carbon & Battery Works of National Carbon Co.
Perfection Supply Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

BRUSHES, Metallic.
Cutler-Hammer Mfg. Co.
General Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

BUFFERS, Motor Driven.
Fairbanks, Morse & Co.
Westinghouse Electric & Mfg. Co.

BUILDINGS, OFFICE AND MILL.
American Bridge Co.

BUNKERS AND HOPPERS.
American Bridge Co.

BURGLAR ALARMS.
Manhattan Electrical Supply Co.
Ostrander & Co., W. R.

BUS BAR SUPPORTS.
Delta-Star Electric Co.
Electrical Engineers' Equipment Co.
Royal Electric Mfg. Co., Inc.

BUSHINGS AND LOCKNUTS. (For Conduit.)
Anderson Mfg. Co., Albert & J. M.
Faries Mfg. Co.
General Electric Co.
National Metal Molding Co.
Phelps, James C.
Sprague Electric Works.
Thomas & Betts Co.

BUSHINGS, Porcelain Clamping.
General Electric Co.
Pass & Seymour, Inc.

BUSHINGS, Socket.
Dickinson Mfg. Co.
Hemming Mfg. Co.
Mechanical Rubber Co.
Western Electric Co.

CABLES.
American Electrical Works.
American Steel & Wire Co.
American Insulated Wire & Cable Co.
Atlantic Insulated Wire & Cable Co.
Belden Mfg. Co.
Central Electric Co.
Electric Cable Co.
General Electric Co.
Habirshaw Wire Co.
Hazard Mfg. Co.
Kerite Insulated Wire & Cable Co.
Moore, Alfred F.
National Conduit & Cable Co.
Okonite Co., The.
Roebling's Sons Co., John A.
Safety Insulated Wire & Cable Co.
Simplex Wire & Cable Co.
Standard Underground Cable Co.
Western Electric Co.

CABLE BELLS.
Electrical Engineers' Equipment Co.

CABLE HANGERS.
Anderson Mfg. Co., Albert & J. M.
Hubbard & Co.
Metropolitan Engineering Co.
Mineraliac Electric Co.
Standard Underground Cable Co.
Western Electric Co.

CABLE RACKS.
Cope, T. J.
Electrical Engineers' Equipment Co.
General Electric Co.
Metropolitan Engineering Co.
Standard Underground Cable Co.

CABLE TERMINALS.
Standard Underground Cable Co.

CABLE TESTERS.
Metropolitan Engineering Co.
Mineraliac Electric Co.
Roller-Smith Co.
Standard Underground Cable Co.

CABLES, Armored. (Flexible.)
National Metal Molding Co.
Sprague Electric Works.
Standard Underground Cable Co.
Western Conduit Co.

CABLING MACHINES.
New England Butt Co.

CALIBRATORS, Meter.
General Electric Co., Ft. Wayne Dept.
Roller-Smith Co.

CANOPY INSULATORS.
Faries Mfg. Co.
General Electric Co.
Mica Insulator Co.

CARBONS, Arc Light.
Central Electric Co.
General Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

CARBONS, Battery.
Manhattan Electrical Supply Co.

CAR HEATING, Electric.
Simplex Electric Heating Co.
Western Electric Co.

CARS, DERRICK.
American Bridge Co.

CASTINGS.
Anderson Mfg. Co., Albert & J. M.
New England Butt Co.

CEMENT MACHINERY.
Allis-Chalmers Manufacturing Co.

CHANDELIERS.
Beardslee Chandelier Mfg. Co.
Central Electric Co.
Faries Mfg. Co.

CHANGERS, Inc. Lamp.
McGill Mfg. Co.

CHARGING OUTFITS.
Crocker-Wheeler Co.
Cutler-Hammer Mfg. Co.
Fairbanks, Morse & Co.
General Electric Co.
Wagner Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.

CHOKE COILS.
Anderson Mfg. Co., Albert & J. M
Delta-Star Electric Co.
General Electric Co.
Metropolitan Engineering Co.
Schweitzer & Conrad, Inc.
Westinghouse Electric & Mfg. Co.

CIGAR LIGHTERS.
General Electric Co.
Simplex Electric Heating Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

CIRCUIT BREAKERS, Automatic.
Cutler-Hammer Mfg. Co.
Cutter Co.
Electric Controller & Mfg. Co.
General Electric Co.
General Electric Co., Ft. Wayne Dept.
Roller-Smith Co.
Sundh Electric Co.
Ward Leonard Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

CLAMPS, Cable Supporting.
Delta-Star Electric Co.
Electrical Engineers' Equipment Co.
General Devices & Fittings Co.

CLAMPS, FLEXIBLE TUBING.
Delta-Star Electric Co.

CLAMPS, Insulator.
Clark Electric & Mfg. Co.
Electrical Engineers Equipment Co.
States Co.

CLEATS, Fibre.
Blake Signal & Mfg. Co.
General Electric Co.

CLEATS, Insulating.
Hemming Mfg. Co.
Mineraliac Electric Co.

CLIMBERS, Linemen's.
Klein & Sons, Mathias.
Oshkosh Mfg. Co.
Western Electric Co.

CLOTH, Insulating.
Mica Insulator Co.
Mechanical Rubber Co.

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Central Electric Co.
Delta-Star Electric Co.
Faries Mfg. Co.
McGill Mfg. Co.
Western Electric Co.

COAL MINING MACHINERY.
Allis-Chalmers Manufacturing Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

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American Electrical Works.
Belden Mfg. Co.
Crocker-Wheeler Co.
D & W Fuse Co.
General Electric Co.
Manhattan Electrical Supply Co.
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Ward-Leonard Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

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McLennan & Co., K.

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Westinghouse Electric & Mfg. Co.

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Fairbanks, Morse & Co.
Westinghouse Machine Co.

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Western Electric Co.

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American Circular Loom Co.
Central Electric Co.
Clifton Mfg. Co.
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National Metal Molding Co.
Tubular Woven Fabric Co.
Western Conduit Co.
Western Electric Co.

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Camp Co., H. B.
Fibre Conduit Co.
National Fireproofing Co.

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Turner Improvement Co., J. W.
Westinghouse Electric & Mfg. Co.

CONDUIT FITTINGS.
Killark Electric Mfg. Co.

CONDUIT THREADERS.
Delta-Star Electric Co.

CONNECTORS.
Clark Electric & Mfg. Co.
Delta-Star Electric Co.
Electrical Engineers' Equipment Co.
Metropolitan Engineering Co.
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Ohio Brass Co.

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Arnold Co.
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Byllesby & Co., H. M.
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New England Butt Co.
Stone & Webster Eng. Corp.
White Companies, J. G.

CONTROLLERS, AUTOMATIC, for Automobile Lighting Systems.
Ward-Leonard Electric Co.

CONTROLLERS, Printing Press.
Allis-Chalmers Manufacturing Co.
Crocker-Wheeler Co.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Co.
Ward Leonard Electric Co.
Westinghouse Electric & Mfg. Co.

CONVERTERS, ROTARY.
Fairbanks, Morse & Co.
General Electric Co.
Northwestern Electric Co.

COOKING DEVICES, Electric.
Cutler-Hammer Mfg. Co.
General Electric Co.
Globe Stove & Range Co.
Hughes Electric Heating Co.
Manhattan Electrical Supply Co.
Simplex Electric Heating Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

COPPERS, Battery.
Manhattan Electrical Supply Co.
Western Electric Co.

CORD, Braided.
Samson Cordage Works.

COUNTING MACHINES.
National Scale Co.

CRANES AND HOISTS.
Allis-Chalmers Manufacturing Co.
Crocker-Wheeler Co.
Fairbanks, Morse & Co.
Sprague Electric Works.

CRANE MOTORS.
Crocker-Wheeler Co.
General Electric Co.
General Electric Co., Ft. Wayne Dept.
Wagner Elec. Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

CROSS ARMS (Wood).
American Bridge Co.
Humbird Lumber Co.
Lindsley Brothers Co.

CURLING IRONS, Electric.
Central Elec. Co.
Manhattan Electrical Supply Co.
Simplex Electric Heating Co.
Westinghouse Electric & Mfg. Co.

CUT-OUTS, Enclosed Fuse, Plug, Combination Rosette, Cut-Out Bases.
Bryant Electric Co.
C. & P. Electric Works.
Central Electric Co.
Chicago Fuse Mfg. Co.
Commonwealth Edison Co.
Detroit Fuse & Mfg. Co.
D & W Fuse Co.
General Electric Co.
Hart Mfg. Co.
Manhattan Electrical Supply Co.
Trumbull Elec. Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

CUT-OUTS, Arc Light.
Brady Electric Mfg. Co.
Bryant Electric Co.
Cutter Co., George.
General Electric Co.
General Electric Co., Ft. Wayne Dept.
Metropolitan Engineering Co.

CUT-OUTS, Transformer.
Central Electric Co.
D & W Fuse Co.
General Electric Supply Co.
Delta-Star Electric Co.
General Electric Co.
Metropolitan Engineering Co.
Schweitzer & Conrad, Inc.
Wagner Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.

DAMS, MOVABLE.
American Bridge Co.

DECORATIVE LIGHTING.
Central Electric Co.
General Electric Co.
Manhattan Electrical Supply Co.

DERRICKS.
American Bridge Co.

DIRECT MOTOR DRIVES.
Crocker-Wheeler Co.
Electric Machinery Co.
Electric Controller & Mfg. Co.
Fairbanks, Morse & Co.
General Electric Co.
Roth Bros. & Co.
Wagner Elec. Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

DOOR SWITCHES.
Cutler-Hammer Mfg. Co.
Hart Mfg. Co.

DRILLS AND BITS, Electricians'.
Morse Twist Drill & Machine Co.
Hubbard & Co.
Orr & Lockett Hardware Co.

DRINK MIXERS, Motor Driven.
Hamilton-Beach Mfg. Co.

ELECTRIC VEHICLES.
General Vehicle Co.

ELECTRO-PLATING MACHINERY.
Crocker-Wheeler Co.
Fairbanks, Morse & Co.
General Electric Co.
General Electric Co., Ft. Wayne Dept.
Sprague Electric Works.
Westinghouse Electric & Mfg. Co.

ELEVATING TRUCKS.

ENGINEERS & CONTRACTORS.
American Bridge Co.
Arnold Co.
Baehr, Wm. A.
Badt-Westburg Electric Co.
Byllesby & Co., H. M.
Jackson, D. C. & W. B.
Lyndon, Lamar.
McMeen & Miller.
Newgard & Co., Henry.
Norton & Bird.
Pillsbury, Chas. A
Sargent & Lundy.
Stone & Webster Engineering Corporation.
Turner Improvement Co., J. W.
Western Electric Co.
White Companies, J. G.
Woodmansee & Davidson, Inc.

ENGINES, Gas and Gasoline.
Allis-Chalmers Manufacturing Co.
Fairbanks, Morse & Co.
Westinghouse Machine Co.

ENGINES, Oil.
Fairbanks, Morse & Co.

ENGINES, Steam.
Allis-Chalmers Manufacturing Co.
Murray Iron Works Co.
Ridgway Dynamo & Engine Co.
Westinghouse Machine Co.

FANS, Motor and Disc.
Central Electric Co.
Century Electric Co.
Crocker-Wheeler Co.
Eck Dynamo & Motor Co.
Emerson Electric Mfg. Co.
Fairbanks, Morse & Co.
General Electric Co.
General Electric Co., Ft. Wayne Dept.
Hunter Fan & Motor Co.
Manhattan Electrical Supply Co.
Menominee Electric Mfg. Co.
Peerless Electric Co.
Robbins & Myers Co.
Sprague Electric Works.
Wagner Elec. Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

FAULT FINDERS, Electric.
Electric Controller & Mfg. Co.

FIBRE.
Continental Fibre Co.
Diamond State Fibre Co.

FIRE ALARMS.
The Palmer Electric & Manufacturing Co.

FIREPLACES, Electric.
General Electric Co.
Westinghouse Electric & Mfg. Co.

FITTINGS, Conduit Terminals, Bushings, Entrance Caps.
Killark Electric Mfg. Co.
National Metal Molding Co.
Phelps, James C.
Sprague Electric Works.

FIXTURES, Electric and Gas.
Beardslee Chandelier Mfg. Co.
Benjamin Electric Co.
Central Electric Co.
Delta-Star Electric Co.
Edwards Lighting Fixture Co.
Faries Mfg. Co.
Federal Sign System (Electric).
Mohrlite Co.
Phoenix Glass Co.
Western Electric Co.

FIXTURES, Indirect Lighting.
Beardslee Chandelier Mfg. Co.
Central Electric Co.
General Electric Co.

FIXTURES, Show Case.
Benjamin Electric Mfg. Co.
Central Electric Co.
Johns-Manville Co., H. W.

FLASHERS, Sign.
Campbell Electric Co.

FLASHLIGHTS.
Delta-Star Electric Co.

FLAT IRONS, Electric.
Central Electric Co.
Cutler-Hammer Mfg. Co.
General Electric Co.
Manhattan Electrical Supply Co.
Simplex Electric Heating Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

FLUXES, Soldering.
Allen Co., Inc., L. B.
Blake Signal & Mfg. Co.
Burnley Battery & Mfg. Co.
Chicago Fuse Mfg. Co.
McGill Mfg. Co.
Manhattan Electrical Supply Co.
Western Electric Co.

FORGINGS.
American Bridge Co.

FUSE PLUGS.
Anderson Mfg. Co., Albert & J. M.
Bryant Electric Co.
D & W Fuse Co.
Daum Co., A. F.
General Electric Co.
Stanley & Patterson.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

FUSE WIRE.
General Electric Co.
Western Electric Co.

FUSES.
Bryant Electric Co.
Central Electric Co.
Chicago Fuse Mfg. Co.
D & W Fuse Co.
Daum, A. F., Co.
Detroit Fuse & Mfg. Co.
Delta-Star Electric Co.
Economy Fuse & Mfg. Co.
Federal Sign System (Electric).
General Electric Co.
Metropolitan Engineering Co.
Schweitzer & Conrad, Inc.
Westinghouse Electric & Mfg. Co.

GATES, HEAD.
American Bridge Co.

GEARS, Rawhide and Composition.
Diamond State Fibre Co.
General Electric Co.
New Process Gear Corp.

GENERATORS.
Allis-Chalmers Mfg. Co.
Crocker-Wheeler Co.
Eck Dynamo & Motor Co.
Electric Machinery Co.
Fairbanks, Morse & Co.
General Electric Co.
General Electric Co., Ft. Wayne Dept.
Ridgway Dynamo & Engine Co.
Wagner Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.

GLASSWARE, Illuminating.
Central Electric Co.
Ivanhoe-Regent Works of General Electric Co.
Western Electric Co.

GLOBES, Arc Light. (Outer and Inner.)
General Electric Co.
Newgard & Co., Henry.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

GRATES.
Murray Iron Works.

GRINDERS.
Hamilton-Beach Mfg. Co.
Wisconsin Electric Co.

GROUND CLAMPS.
General Electric Co.
Hart Mfg. Co.
Hubbard & Co.
Sprague Electric Works.
Thomas & Betts Co.
Western Electric Co.

GUARDS, Inc. Lamp.
Benjamin Electric Mfg. Co.
Hubbell, Inc., Harvey.
McGill Mfg. Co.

GUY CLAMPS.
American Steel & Wire Co.
Hubbard & Co.

HAIR DRYERS, Electric.
Hamilton-Beach Mfg. Co.
Shelton Electric Co.

HANGERS, Conduit and Moulding.
Mineralac Electric Co.
Western Electric Co.

HANGERS AND CLAMPS.
Mineralac Electric Co.
Ohio Brass Co.
Ostrander & Co., W. R.
Sprague Electric Works.
Standard Underground Cable Co.
Thomas & Betts Co.

HEATERS, Electric.
Cutler-Hammer Mfg. Co.
General Electric Co.
Simplex Electric Heating Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

HEATING SYSTEMS, Exhaust Steam.
American District Steam Co.

HOISTING MACHINERY, Electric Mine.
Allis-Chalmers Manufacturing Co.
Fairbanks, Morse & Co.
General Electric Co.

HYDRAULIC MACHINERY.
Allis-Chalmers Manufacturing Co.

INCLINATORS, CARBOY
McCord & Co., Horace.

INSTRUMENTS.
Bristol Co.
Electric Controller & Mfg. Co.
General Electric Co.
General Electric Co., Ft. Wayne Dept.
Leeds & Northrup Co.
Manhattan Electrical Supply Co.
Metropolitan Engineering Co.
Roller-Smith Co.
Schweitzer & Conrad, Inc.
States Co.
Wagner Elec. Mfg. Co.
Westinghouse Elec. & Mfg. Co.
Weston Electrical Instrument Co.

INSULATING CEMENTS.
Dickinson Mfg. Co.
Mechanical Rubber Co.
Westinghouse Electric & Mfg. Co.

INSULATING MACHINERY.
Hubbell, Inc., Harvey.
New England Butt Co.

INSULATING PAINTS AND COMPOUNDS.
Chicago Mica Co.
McGill Mfg. Co.
Mechanical Rubber Co.
Mica Insulator Co.
Mineralac Electric Co.
Sherwin-Williams Co.
Standard Paint Co.
Standard Underground Cable Co.
Ward Leonard Electric Co.
Westinghouse Electric & Mfg. Co.

INSULATION, Hard Rubber Composition, Etc.
Continental Fibre Co.
General Bakelite Co.
Hemming Mfg. Co.
Westinghouse Electric & Mfg. Co.

INSULATORS, Arc Lamp.
Anderson Mfg. Co., Albert & J. M.
Cutter Co., George.
General Electric Co.
Ohio Brass Co.
Westinghouse Electric & Mfg. Co.

INSULATORS, Glass.
General Electric Co.
Hemingray Glass Co.
Locke Insulator Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

INSULATORS, High Voltage.
Dickinson Mfg. Co.
Electrical Engineers' Equipment Co.
General Electric Co.

CLASSIFIED INDEX—Continued

Locke Insulator Mfg. Co.
Ohio Brass Co.
Thomas R., & Sons Co.
Westinghouse Electric & Mfg. Co.

INSULATORS, Wood.
Mineraliac Electric Co.
Westinghouse Electric & Mfg. Co.

IRIDIO-PLATINUM.
Baker & Co., Inc.

JARS, Battery (Glass).
Hemingray Glass Co.

JOINTS, Cable.
General Electric Co.

JOINTS, Fixture Insulating.
Faries Mfg. Co.
Federal Sign System (Electric).
Thomas & Betts Co.

KITCHEN CABINETS.
Federal Sign System (Electric).

LACQUER, Metal.
General Bakelite Co.

LAMPS, Arc.
Anderson Mfg. Co., Albert & J. M.
Central Electric Co.
General Electric Co.
General Electric Co., Ft. Wayne Dept.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

LAMPS, Incandescent.
Anchor Electric Co.
Central Electric Co.
Deuth & Co., Inc.
Edison Lamp Works of General Electric Co.
Franklin Electric Mfg. Co.
Kentucky Electrical Co., Inc.
Lux Mfg. Co.
National Lamp Works of General Electric Company, comprising the following member divisions:
American Electric Lamp Division.
Banner Electric Division.
Boston Economy Lamp Division.
Brilliant Electric Division.
Bryan-Marsh Electric Division.
Buckeye Electric Divison.
Colonial Electric Division.
Columbia Incandescent Lamp Division.
Economical Electric Lamp Division.
Elux Miniature Lamp Division.
Federal Miniature Lamp Division.
Fostoria Incandescent Lamp Division.
General Incandescent Lamp Division.
Monarch Incandescent Lamp Division.
Munder Electric Division.
Packard Lamp Division.
Peerless Lamp Division.
Shelby Lamp Division.
Standard Electric Division.
Sterling Electric Lamp Division.
Sunbeam Incandescent Lamp Division.
New York Electric Lamp Co.
Western Electric Co.
Westinghouse Lamp Co.

LAMPS, MINIATURE.
Mannweiler Co., A. C.

LAMPS, Vapor and Vacuum Tube.
General Electric Co.

LANTERNS.
Manhattan Electrical Supply Co.

LAUNDRY MACHINERY, Electric.
American Iron Machinery Co.

LIGHTING PLANTS.
Crocker-Wheeler Co.
Fairbanks, Morse & Co.
General Electric Co.
Ridgway Dynamo & Engine Co.
Westinghouse Electric & Mfg. Co.

LIGHTNING ARRESTERS.
Anderson Mfg. Co., Albert & J. M.
Central Electric Co.
Delta-Star Electric Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.
Railway and Industrial Engineering Co.
Schweitzer & Conrad, Inc.
Westinghouse Electric & Mfg. Co.

LIGHTS, Desk.
Faries Mfg. Co.
Federal Sign System (Electric).

LIGHTS, Stage.
General Electric Co.

LINE MATERIALS.
Anderson Mfg. Co., Albert & J. M.
Central Electric Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

LOCOMOTIVES, Electric.
General Electric Co.
Westinghouse Electric & Mfg. Co.

LUGS.
Chicago Fuse Mfg. Co.
Delta-Star Electric Co.
Electrical Engineers' Equipment Co.
General Electric Co.
Trumbull Electric Mfg. Co.

MAGNETIC SWITCH CONTROLLERS.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Co.
Sundh Electric Co.
Westinghouse Electric & Mfg. Co.

MAGNETOS, MAGNETO-GENERATORS AND BELLS.
Manhattan Electrical Supply Co.
Menominee Electric Mfg. Co.
Western Electric Co.

MAGNETOS, Ignition.
General Electric Co.
Manhattan Electrical Supply Co.

MAGNETS, Electro.
Acme Wire Co.
Belden Mfg. Co.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Co.
Manhattan Electrical Supply Co.
Sundh Electric Co.
Ward Leonard Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

MAGNETS, Lifting.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
Sundh Electric Co.
Western Electric Co.

MAGNETS, Permanent.
Esterline Co.
Western Electric Co.

MARINE FIXTURES.
Benjamin Electric Mfg. Co.
Delta-Star Electric Co.
General Electric Co.

MAST ARMS.
Brady Electric Mfg. Co.
Cutter Co., George.
General Electric Co., Ft. Wayne Dept.
Pittsburgh Transformer Co.

MEASURING MACHINES (For Wire Measuring).
Minneapolis Electric & Construction Co.
New England Butt Co.

MEDICAL APPARATUS.
Bleadon-Dunn Co.

METAL FITTINGS.
Peru Electric Co.

METAL SHEARS.
Chicago Patented Tools Co.

METERS, Recording.
Bristol Co.
Esterline Co.
General Electric Co.
Schweitzer & Conrad, Inc.
Westinghouse Electric & Mfg. Co.

MICA.
Chicago Mica Co.
Mica Insulator Co.

MINING MACHINERY (Motor Driven).
Allis - Chalmers Manufacturing Co.
Fairbanks, Morse & Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

MOLDED INSULATION.
Cutler-Hammer Mfg. Co.
General Bakelite Co.
Hemming Mfg. Co.
Westinghouse Electric & Mfg Co.

MOTORS AND DYNAMOS.
Advance Electric Co.
Allis-Chalmers Manufacturing Co.
Central Electric Co.
Century Electric Co.
Crocker-Wheeler Co.
Eck Dynamo & Motor Co.
Electric Machinery Co.
Emerson Electric Mfg. Co.
Fairbanks, Morse & Co.
General Electric Co.
General Electric Co., Ft. Wayne Dept.
Kentucky Electrical Co., Inc.
Menominee Electric Mfg. Co.
Peerless Electric Co.
Ridgway Dynamo & Engine Co.
Robbins & Myers Co.
Sprague Electric Works.
Wagner Electric Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.
Wisconsin Electric Co.

MOULDING.
National Metal Molding Co.
Trumbull Electric Mfg. Co.

OZONIZERS.
Federal Sign System (Electric).
General Electric Co.

PACKING, Steam.
New York Insulated Wire Co.

PAINTS, Preservative.
Johns-Manville Co., H. W.
Standard Paint Co.
Mechanical Rubber Co.

PANELBOARDS.
Newgard & Co., Henry.
Trumbull - Vanderpoel Electric Mfg. Co.

PAPER, Insulating Paper, Fuller Board, Press Board.
Diamond State Fibre Co.
Mechanical Rubber Co.

PATENT SOLICITORS.
Duvall, Edw. S.
Howe, Thomas.
Siggers, E. G.

PHOTOMETERS, Lamp Testing.
Leeds & Northrup Co.

PHOTOMETER STANDARDS.
Electrical Testing Laboratories.

PIGTAILS AND FLEXIBLE LEADS.
Belden Mfg. Co.
Rome Wire Co.

PINS AND BRACKETS, Wood.
Electrical Engineers' Equipment Co.
Mineraliac Electric Co.
Ohio Brass Co.

PIPE COVERINGS, STEAM.
American District Steam Co.

PLATFORMS (Pole Seats).
Hubbard & Co.
Oshkosh Mfg. Co.

PLATINUM.
American Platinum Works.
Baker & Co., Inc.

PLIERS, Wire Cutting.
Bryant Electric Co.
Klein & Sons, Mathias.

PLUGS AND RECEPTACLES, Flush.
Bryant Electric Co.
Cutler-Hammer Mfg. Co.
Delta-Star Electric Co.
General Electric Co.
Hart Mfg. Co.
Manhattan Electrical Supply Co.
Trumbull Electric Mfg. Co.

PLUGS AND RECEPTACLES, Power.
Central Electric Co.

PLUGS AND RECEPTACLES, Stage.
Bryant Electric Co.
General Electric Co.
Hubbell, Inc., Harvey.
Manhattan Electrical Supply Co.
Western Electric Co.

POLES, Concrete.
American Steel & Wire Co.

POLES, Steel.
American Bridge Co.

POLES, Treated.
Chapin, E. T., Co.
Crawford Cedar Co.
Lindsley Bros. Co.
National Pole Co.
Naugle Pole & Tie Co.
Page & Hill Co.
Partridge Lumber Co., T. M.
Valentine-Clark Co.

POLES, Wood.
Carney & Co., B. J.
Chapin, E. T., Co.
Crawford Cedar Co.
Duluth Log Co.
Everts Lumber Co., G. W.
Fowler Co., John H.
Humbird Lumber Co.
Larson Bros. Lumber Co.
Lindsley Bros. Co.
Morrison Lumber Co., J. W.
National Pole Co.
Naugle Pole & Tie Co.
Northern White Cedar Ass'n.
Page & Hill Co.
Partridge Lumber Co., T. M.
Sandpoint Lumber & Pole Co., Ltd.
Sterling & Son Co., W. C.
Torrey Cedar Co.
Valentine-Clark Co.
Western Electric Co.
Western Red Cedar Ass'n.
Wheeler-Arnold Co.

POLE STEPS.
American Steel & Wire Co.
Anderson Mfg. Co., Albert & J. M.
Cutter Co., George.
Hubbard & Co.
Oshkosh Mfg. Co.

PORCELAIN, Special Shapes.
Cook Pottery Co.
Findlay Electric Porcelain Co.
General Porcelain Co
Peru Electric Co.
Thomas, R., & Sons Co.
Westinghouse Electric & Mfg. Co.

PORCELAIN, Standard.
Cook Pottery Co.
General Electric Co.
General Porcelain Co.
Illinois Electric Porcelain Co.
Locke Insulator Mfg. Co.
Ohio Brass Co.
Thomas, R., & Sons Co.
Westinghouse Electric & Mfg. Co.

PORTABLES, Electric Reading Lamps.
Herwig Art Shade & Lamp Co.
Central Electric Co.
Faries Mfg. Co.

POSTS, Lamp.
Central Electric Co.
Cutter Co., George.
Delta-Star Electric Co.
Flour City Ornamental Iron Wks.
King Foundry Co.
Metropolitan Engineering Co.

POTENTIOMETERS.
Leeds & Northrup Co.

POTHEADS AND SLEEVES.
Brady Electric Mfg. Co.
Central Electric Co.
Delta-Star Electric Co.
Electrical Engineers' Equipment Co.
General Electric Co.
Mineraliac Electric Co.
Okonite Co., The.
Schweitzer & Conrad, Inc.
Standard Underground Cable Co.

PRESERVATIVES, Wood.
General Bakelite Co.

PRODUCERS, Gas.
Allis-Chalmers Manufacturing Co.
Fairbanks, Morse & Co.
Westinghouse Machine Co.

PROJECTORS, Electric. (Search Lights.)
American Lighting Co.
General Electric Co.
General Electric Co., Ft. Wayne Dept.

PROJECTORS, Telephone.
D & W Fuse Co.

PYROMETERS, Electric.
Bristol Co.
Leeds & Northrup Co.

PULLEYS, Arc Lamp.
General Electric Co., Ft. Wayne Dept.
Cutter Co., George.
Fairbanks, Morse & Co.

PUMPS, STEAM AND POWER.
Fairbanks, Morse & Co.

PUMPS, Water.
Allis-Chalmers Manufacturing Co.
Fairbanks, Morse & Co.

PUSH BUTTONS.
Central Electric Co.
Cutler-Hammer Mfg. Co.
Manhattan Electrical Supply Co.
Western Electric Co.

RACKS, Carboy.
McCord Co., Horace.

RACKS AND RINGS, Telephone Distributing.
Hubbard & Co.

RADIATORS, Luminous.
General Electric Co.

RAIL BONDS.
American Steel & Wire Co.
General Electric Co.
Ohio Brass Co.
Western Electric Co.

RAIL JOINTS.
Ohio Brass Co.
Western Electric Co.

RAIL BOND TESTERS.
Roller-Smith Co.

RAILWAY SPECIALTIES, Electric.
Anderson Mfg. Co., Albert & J. M.
Blake Signal & Mfg. Co.
General Electric Co.
Ohio Brass Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

RECEPTACLES, Sign.
Benjamin Electric Mfg. Co.
Bryant Electric Co.
Federal Sign System (Electric).
General Electric Co.
Newgard & Co., Henry.

RECEPTACLES, Weatherproof.
Bryant Electric Co.
Federal Sign System (Electric).
General Electric Co.
Newgard & Co., Henry.

RECORDERS, Time.
Bristol Company.

RECTIFIERS.
General Electric Co.
Wagner Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.

REELS, Wire.
Klein & Son, Mathias.
Minneapolis Elec. & Const. Co.
Oshkosh Mfg. Co.

REFLECTORS, Mirror.
Ivanhoe-Regent Works of General Electric Co.
Phoenix Glass Co.

REPAIRS, Armature.
Boustead Electric & Mfg. Co.
Commonwealth Edison Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

RESISTANCE, Banks and Units.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Co.
Sprague Electric Works.
Sundh Electric Co.
Ward Leonard Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg Co.

CLASSIFIED INDEX—Continued

RESISTANCE WIRE & RIBBON.
American Steel & Wire Co.
Belden Mfg. Co.
Driver-Harris Wire Co.
General Electric Co.
Moore, Alfred F.

REVERSING CONTROLLERS FOR CRANES, ETC.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

RHEOSTATS.
Allis-Chalmers Manufacturing Co.
Campbell Electric Co.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
Esterline Co.
General Electric Co.
General Electric Co., Ft. Wayne Dept.
Sundh Electric Co.
Sprague Electric Works.
Ward Leonard Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

ROLLER BEARINGS.
Hyatt Roller Bearing Co.

RUNWAYS, CRANE.
American Bridge Co.

SCALES.
Fairbanks, Morse & Co.

SECOND HAND MACHINERY.
Boustead Electric & Mfg. Co.
General Electric Co.
Gregory Electric Co.
Nussbaum & Co., V. M.

SHADE HOLDERS.
Bryant Electric Co.
Bridgeport Brass Co.
Faries Mfg. Co.
General Electric Co.
Hubbell, Inc., Harvey.
Western Electric Co.

SHADES, ASBESTOS.
Asbesto-Gleam Mfg. Co.

SHADES, Metallic.
Benjamin Electric Mfg. Co.
Central Electric Co.
Cutter Co., George.
Faries Mfg. Co.
Federal Sign System (Electric).
Herwig Art Shade & Lamp Co.
Hubbell, Inc., Harvey.
Ivanhoe-Regent Works of General Electric Co.
Ostrander & Co., W. R.
Phoenix Glass Co.

SHEDS, COAL STORAGE.
American Bridge Co.
Fairbanks, Morse & Co.

SHEDS, TRAIN.
American Bridge Co.

SHEETS, Iron and Steel.
American Sheet & Tin Plate Co.

SHOCK ABSORBERS.
Benjamin Electric Mfg. Co.

SHOE DRYERS, Electric.
Hamilton-Beach Mfg. Co.

SIGNS, Electric.
Federal Sign System (Electric).

SLATE.
Davis Slate & Mfg. Co.

SLEEVINGS.
Belden Mfg. Co.
Chicago Mica Co.
Standard Underground Cable Co.

SLEEVES, Paper.
Standard Underground Cable Co.

SOCKETS AND RECEPTACLES
Benjamin Electric Mfg. Co.
Best Electric Co.
Bryant Electric Co.
Central Electric Co.
Cutler-Hammer Mfg. Co.
Dickinson Mfg. Co.
Faries Mfg. Co.
Federal Sign System (Electric).
General Electric Co.
Hubbell, Inc., Harvey.
Menominee Electric Mfg. Co.
Ostrander & Co., W. R.
Trumbull Electric Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

SOCKETS, Locking.
Best Electric Co.
Cutler-Hammer Mfg. Co.
General Electric Co.
Pass & Seymour, Inc.

SOLDERING IRONS.
Manhattan Electrical Supply Co.
Simplex Electric Heating Co.
Ward Leonard Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

SPRINGS.
American Platinum Works.
American Steel & Wire Co.
Manross & Sons, F. N.

STACKS.
American Bridge Co.

STAGE LIGHTING APPARATUS.
Anderson Mfg. Co., Albert & J. M.
General Electric Co.
Sundh Electric Co.

STANDARD CELLS.
Leeds & Northrup Co.
Weston Electrical Instrument Co.

STAPLES AND TACKS, Insulating.
Blake Signal & Mfg. Co.

STATIONS, Coaling.
American Bridge Co.
Fairbanks, Morse & Co.

STATIONS, Elevated Ramway.
American Bridge Co.

STEEL, Structural and Tool.
American Bridge Co.

STERILIZERS, Instrument.
Cutler-Hammer Mfg. Co.
Simplex Electric Heating Co.
Westinghouse Electric & Mfg. Co.

STOKERS, Mechanical.
Babcock & Wilcox Co.
Westinghouse Machine Co.

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Estate Stove Co.
General Electric Co.
Globe Stove & Range Co.
Hughes Electric Heating Co.
Manhattan Electrical Supply Co.
Rathbone, Sard & Co.
Westinghouse Electric & Mfg. Co.

STRAIN INSULATORS.
Anderson Mfg. Co., Albert & J. M.
General Electric Co.
Ohio Brass Co.

STREET LIGHTING FIXTURES, Incandescent.
Benjamin Electric Mfg. Co.
Brady Electric Mfg. Co.
Central Electric Co.
Cutter Co., George.
Delta-Star Electric Co.
Federal Sign System (Electric).
General Electric Co.
General Electric Co., Ft. Wayne Dept.
Hubbell, Inc., Harvey.
Pittsburgh Transformer Co.

SUB-STATIONS, Outdoor.
Delta-Star Electric Co.
Railway & Industrial Engineering Co.
Schweitzer & Conrad, Inc.

SUPPLIES, Electrical.
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Commonwealth Edison Co.
Manhattan Electrical Supply Co.
Western Electric Co.

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Electric Controller & Mfg. Co.
Electrical Testing Laboratories.
General Electric Co.
General Electric Co., Ft. Wayne Dept.
Metropolitan Engineering Co.
Newgard & Co., Henry.
Trumbull Electric Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

SWITCHBOARDS, Theater.
Delta-Star Electric Co.
Electrical Testing Laboratories.
Trumbull Electric Mfg. Co.

SWITCHES.
Allis-Chalmers Manufacturing Co.
Anderson Mfg. Co., Albert & J. M.
Benjamin Elec. Mfg. Co.
Bryant Electric Co.
Central Electric Co.
Columbia Metal Box Co.
Crocker-Wheeler Co.
Cutler-Hammer Mfg. Co.
D & W Fuse Co.
Delta-Star Electric Co.
Detroit Fuse & Mfg. Co.
Electric Controller & Mfg. Co.
Electrical Engineers' Equipment Co.
General Electric Co.
Hart Mfg. Co.
Hubbell, Inc., Harvey.
Manhattan Electrical Supply Co.
Menominee Electric Mfg. Co.
Metropolitan Engineering Co.
Mineraliac Electric Co.
Newton Mfg. Co.
Ostrander & Co., W. R.
Palmer Elec. & Mfg. Co.
Railway & Industrial Engineering Co.
Royal Electric Mfg. Co., Inc.
Schweitzer & Conrad, Inc.
Sundh Electric Co.
Trumbull Electric Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

TANKS, Oil Storage.
American Bridge Co.

TANKS, Water.
American Bridge Co.

TAPE, Insulating.
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Belden Mfg. Co.
Central Electric Co.
Chicago Mica Co.
D & W Fuse Co.
General Electric Co.
Marion Insulated Wire & Rubber Co.
Mica Insulator Co.
Mineraliac Electric Co.
New York Insulated Wire Co.
Okonite Co., The.
Standard Paint Co.
Standard Underground Cable Co.
Mechanical Rubber Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

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Benjamin Electric Mfg. Co.
Hubbell, Inc., Harvey.
Manhattan Electrical Supply Co.

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Manhattan Electrical Supply Co.
Menominee Electric Mfg. Co.
Western Electric Co.

TESTING LABORATORIES.
Electrical Testing Laboratories, Inc.
Underwriters' Laboratories.

THERMOMETERS, Electric.
Bristol Company.
Leeds & Northrup.

TIES, Pressed Steel.
American Bridge Co.

TIME SWITCHES.
Campbell Electric Co.
Hartford Time Switch Co.
Mineraliac Electric Co.

TOGGLE BOLTS.
Cutter Co., George.

TOOLS, Cable Pulling.
American Steel & Wire Co.
General Electric Co.
Hazard Mfg. Co.
Hubbard & Co.
Roebling's Sons Co., John A.
Safety Insulated Wire & Cable Co.

TOOLS, Commutator Truing.
General Electric Co., Ft. Wayne Dept.
General Electric Co.

TOOLS, Linemen's.
Central Electric Co.
Hubbard & Co.
Klein & Sons, Mathias.
Oshkosh Mfg. Co.
Schweitzer & Conrad, Inc.
Smith & Hemenway Co., Inc.
Sprague Electric Works.

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General Electric Co.
General Electric Co., Ft. Wayne Dept.
Orr & Lockett Hardware Co.
Robbins & Myers Co.
Sprague Electric Works.
Western Electric Co.

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Bridgeport Brass Co.
McGill Mfg. Co.

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American Bridge Co.

TOWERS, Steel Transmission.
American Bridge Co.

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Crocker-Wheeler Co.
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General Electric Co.
General Electric Co., Ft. Wayne Dept.
Kuhlman Electric Co.
Manhattan Electrical Supply Co.
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General Electric Co.

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Ohio Brass Co.

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General Electric Co.

TROLLEYS & CHAIRS.
Oshkosh Mfg. Co.

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American Bridge Co.

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Alphaduct Co.
Bridgeport Brass Co.
Faries Mfg. Co.

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Westinghouse Machine Co.

TURBINES, Steam
Allis-Chalmers Manufacturing Co.

TURBINES, Water.
Allis-Chalmers Manufacturing Co.

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Standard Underground Cable Co.
Turner Improvement Co., J. W.

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Western Electric Co.
Wisconsin Electric Co.

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General Electric Co.
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Standard Underground Cable Co.
Mechanical Rubber Co.
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Haag Bros. Co.
Home Specialty Mfg. Co.
Horton Mfg. Co.
Meadows Mfg. Co.
Newton Mfg. Co.
Western Electric Co.
White Lily Mfg. Co.

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Duncan Electric Mfg. Co.
Federal Sign System (Electric).
General Electric Co.
General Electric Co., Ft. Wayne Dept.
Roller-Smith Co.
Sangamo Electric Co.
Westinghouse Elec. & Mfg. Co.

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Belden Mfg. Co.
Hubbard & Co.

WINDLASSES, Arc Lamps.
Brady Electric Mfg. Co.
Cutter Co., George.
Hubbard & Co.

WIRE, ASBESTOS COVERED.
Belden Mfg. Co.

WIRE, Bare and Insulated.
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American Insulated Wire & Cable Co.
American Steel & Wire Co.
Atlantic Insulated Wire & Cable Co.
Belden Mfg. Co.
Bridgeport Brass Co.
Chicago Fuse Mfg. Co.
D & W Fuse Co.
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Electric Cable Co.
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Habirshaw Wire Co.
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Mass. Electric Mfg. Co.
Marion Insulated Wire & Rubber Co.
Moore, Alfred F.
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New York Insulated Wire Co.
Okonite Co., The.
Peerless Insulated Wire & Cable Co.
Phillips, Eugene F.
Phillips Insulated Wire Co.
Roebling's Sons Co., John A.
Rome Wire Co.
Safety Insulated Wire & Cable Co.
Simplex Wire & Cable Co.
Standard Underground Cable Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

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American Steel & Wire Co.
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WE SHALL KEEP OPEN HOUSE AT OUR OFFICES DURING CONVENTION WEEK AND YOUR VISIT WILL BE APPRECIATED.

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Wm. S. Monroe *James Lyman*

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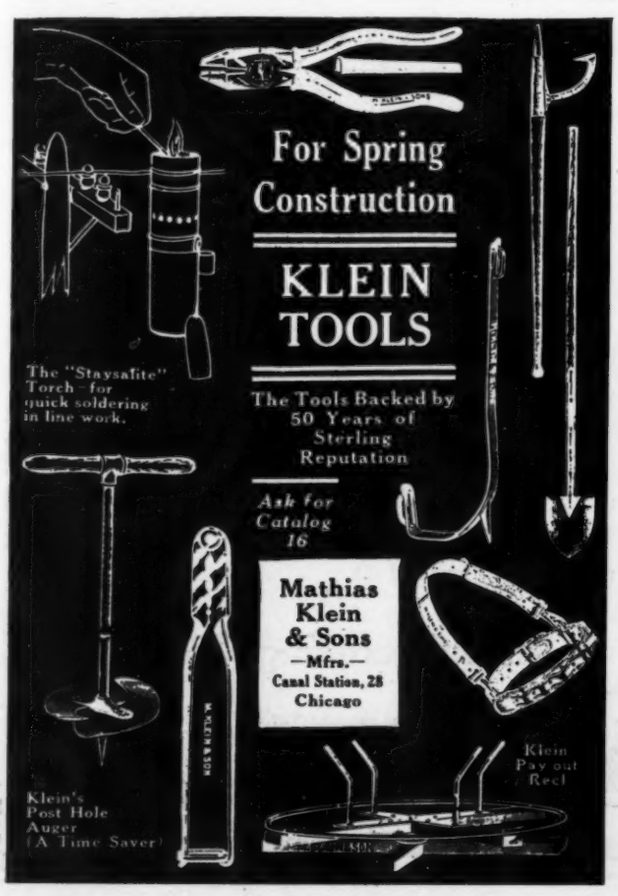
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The Tools Backed by 50 Years of Sterling Reputation
Ask for Catalog 16
Mathias Klein & Sons
—Mfrs.—
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The "Staysafite" Torch—for quick soldering in line work.
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The Oshkosh Folding Take-up Reel

Save two men's work in taking down wire with this handy device which does away with throwing tangled wire on a wagon. Will coil wire to whatever size you desire. Weighs only forty-five pounds. Strongly constructed and durable. Frame folds up into a neat, compact bundle. Will pay for itself in a short time.

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Oshkosh reels have gained an enviable reputation for durability. Light reels are built throughout of rock elm and heavily braced and reinforced with steel. The legs are of heavy steel and are bolted on to the barrow handle. The heavy reels are made of heavier material and are better braced, and reinforced with plate steel. Guaranteed against all defects. Guard pins for either light or heavy reels are adjustable for twelve, eighteen, twenty-one and twenty-four inch coils.

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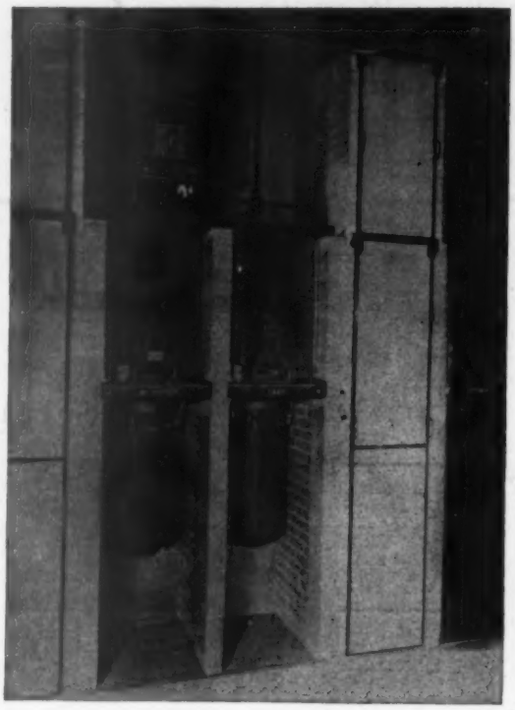
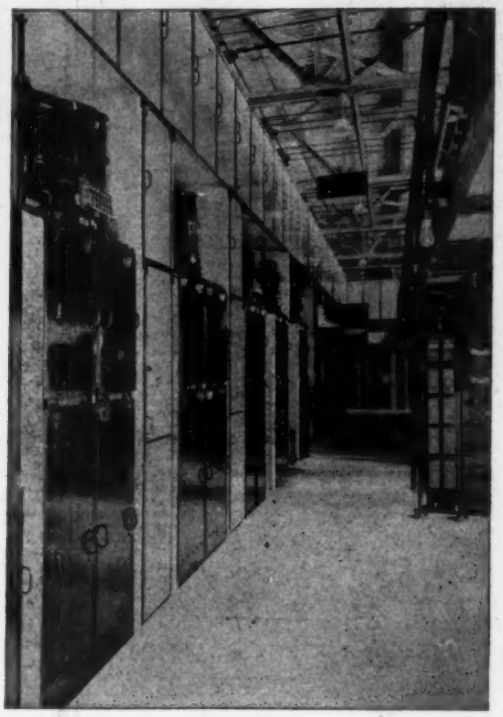
3T





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6 Capacities

Up to 2,000 amperes, 22,000 volts.
Up to 4,000 amperes, 16,500 volts.

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Individual-pole units controlled by a single electrically-operated mechanism.

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